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1881 WOOD, The Rev. Theodore, 23, *Broderick-road, Upper Tooting* S.W.
1894 WOOLF, Michael Yeatman, 1, *Marlborough-place, St. John's Wood*, N.W.
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Kongliga Svenska Vetenskaps-Akademie Bihang, XVIII. Afd. 4. *The Academy.*

SWITZERLAND.

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THE

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1894.

I. On a collection of *Lepidoptera* from Upper Burma, by EDWARD MEYRICK, B.A., F.Z.S.

[Read Oct. 18th, 1893.]

THE species enumerated in this paper were collected by Surgeon-Captain N. Manders, whilst taking part in those military movements, directed to the pacification of the Shan States and their neighbourhood, which followed the annexation of the territory. Most of the country visited was previously unknown to Europeans, and highly interesting. The unhealthy climate, however, naturally kept Dr. Manders' hands full of other work, and the continued presence of hostile natives made collecting always dangerous and often impossible; whilst an unfortunate wound from an enemy in ambush eventually led to his being invalided home when just about to visit some of the most promising regions. Under these trying circumstances the collection is a remarkable record of persevering work. I had originally hoped to have worked out the whole, but in the face of the pressure of other work this has proved impossible, and

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part has been transferred to other hands. The families or groups here presented, however, are worked out in full, viz., the *Arctiadæ*, *Pyralidina*, and *Tineina*.

ARCTIADÆ.

1. *Pelosia tetrasema*, sp. n.

♂ ♀. 42—45 mm. Head and palpi ochreous-orange, apex of palpi blackish. Thorax whitish-ochreous, with an orange central spot, a round blackish posterior spot, and a black longitudinal mark on patagia; in ♂ also two blackish spots on collar. Abdomen ochreous-orange. Forewings whitish-ochreous; a cloudy roundish blackish spot in disc posteriorly, and a second beneath it on fold; in ♂ both reduced to dots; cilia yellow. Hindwings in ♂ ochreous-whitish, hindmargin yellow, in ♀ wholly ochreous-yellow; cilia yellow.

Hab. Koni; three specimens.

Allied to *P. puncticollis*, Butl.

2. *Bizone javanica*, Butl.

Hab. Fort Stedman.

3. *Bizone harterti*, Elwes.

Hab. Koni.

4. *Ammatho defecta*, Walk.

Hab. Fort Stedman.

5. *Ammatho disticha*, sp. n.

♀. 27 mm. Head, palpi, and thorax ochreous-rosy. Abdomen pale rosy. Forewings ochreous-rosy; a black dot near base; two nearly straight transverse series of small round blackish spots, first of four, at $\frac{1}{5}$, second of five, median. Hindwings pale rosy.

Hab. Fort Stedman; one specimen.

6. *Ammatho epixantha*, sp. n.

♂. 28 mm. Head deep yellow. Thorax deep yellow, with a transverse series of four black dots, and one near posterior extremity. Abdomen ochreous-yellow. Forewings rather deep ochreous-yellow; markings cloudy blackish-fuscous; a black dot near base; a transverse row of dots about $\frac{1}{4}$, angulated above middle; a nearly straight transverse row of dots before middle; a

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third series from $\frac{3}{5}$ of costa to $\frac{2}{3}$ of inner margin, rather strongly curved outwards on upper $\frac{2}{3}$, five median dots produced into short streaks posteriorly, and two additional short streaks above uppermost of them; cilia yellow. Hindwings and cilia pale yellowish.

Hab. Koni; one specimen.

7. *Miltochrista rubricosa*, Moore.

Hab. Fort Stedman.

8. *Miltochrista sinica*, Moore.

Hab. Koni.

9. *Miltochrista callinoma*, sp. n.

♀. 27 mm. Head pale rosy, face ochreous-whitish. Thorax pale rosy, towards middle whitish, with two blackish dots. Abdomen pale rosy. Forewings rosy; all veins except costal branches marked with blackish-grey lines, edged on both sides with grey-whitish shades; these do not reach hindmargin, which is wholly rosy; cilia grey-whitish. Hindwings light rosy; cilia whitish.

Hab. Koni; one specimen.

10. *Miltochrista eccentropis*, sp. n.

♂. 20 mm. Head white. Palpi dark fuscous, apex white. Thorax orange, posterior extremity white. Abdomen ochreous-yellowish. Forewings white; a dark grey roundish spot near base, followed by two curved transverse series of similar spots, five in each series; a curved orange antemedian fascia; a small black discal spot beyond middle; a fine blackish transverse line from beyond middle of costa to $\frac{3}{4}$ of inner margin, forming a rather angular bend outwards round discal spot; beyond this all veins marked by blackish well-defined lines; cilia white. Hindwings ochreous-whitish; hairs towards base more yellowish; veins towards hindmargin marked with short cloudy dark grey streaks, sometimes confluent, diminishing downwards and not reaching anal angle; cilia white.

Hab. Koni; two specimens.

11. *Miltochrista celidopa*, sp. n.

♂ ♀. 20—25 mm. Head and thorax ochreous-yellow. Abdomen pale ochreous-yellowish, anal tuft grey. Forewings whitish-ochreous, base, costa, and a hindmarginal band ochreous-yellow,

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sometimes wholly ochreous-yellow; a black dot near base; a round black discal dot beyond middle; cilia ochreous-yellow. Hindwings pale ochreous-yellowish, sometimes suffused with grey except towards hindmargin.

Hab. Koni; three specimens.

12. *Miltochrista geodetis*, sp. n.

♂ ♀. 18—22 mm. Head blackish, sides orange. Thorax orange, with black dots on shoulders and patagia, sometimes confluent, a black transverse mark in middle of back, and a spot near posterior extremity. Abdomen blackish, sides and apex orange. Forewings orange; markings black; a dot near base; a small round spot on or near costa at $\frac{1}{3}$, another beneath it near inner margin, a third in disc at $\frac{3}{5}$, and sometimes a fourth on anal angle; a streak along posterior half of costa round apex and hindmargin to anal angle; cilia blackish. Hindwings dull orange; a blackish streak along hindmargin and round apex; sometimes a more or less broad dark fuscous suffusion before this; sometimes a small dark fuscous spot beneath costa at $\frac{2}{3}$; cilia blackish.

Hab. Koni; three specimens.

13. *Oxacme dissimilis*, Hamps.

Hab. Koni.

14. *Lebena fragilis*, Swinh.

Hab. Koni.

15. *Rajendra tripartita*, Walk.

Hab. Fort Stedman.

16. *Phissama transiens*, Walk.

Hab. Fort Stedman.

17. *Spilosoma indica*, Guér.

Hab. Fort Stedman.

18. *Deiopeia pulchella*, L.

Hab. Koni.

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PYRALIDINA.

PYRAUSTIDÆ.

1. *Margaronia nitidicostalis*, Gn.

Hab. Koni.

2. *Margaronia amphitritalis*, Gn.

Hab. Fort Stedman.

3. *Margaronia unionalis*, Hb.

Hab. Koni: large but otherwise typical.

4. *Margaronia celsalis*, Walk.

Hab. Koni.

5. *Margaronia tyres*, Cr.

Hab. Koni.

6. *Margaronia callizona*, sp. n.

♂. 25 mm. Thorax dark fuscous, with two white stripes. Abdomen dark fuscous, on sides and beneath white, above with a broad orange band occupying three segments before apex, edged with black. Forewings dark fuscous; markings violet-white, thinly scaled; a small wedge-shaped mark in disc at $\frac{1}{5}$; a narrow white streak along inner margin from base to $\frac{2}{3}$, indented in middle; a large oblique elongate pear-shaped blotch in disc before middle, nearly reaching margins; a pale grey transverse mark in middle of disc; a large transverse oval blotch beyond middle, not reaching margins; a transverse white spot beneath costa at $\frac{5}{6}$, emitting a fuscous-whitish line to inner margin before anal angle; cilia dark fuscous, with a white patch above anal angle. Hindwings violet-white, thinly scaled; a moderately broad dark fuscous hind marginal band, including a cloudy fuscous-whitish line; cilia fuscous with a cloudy dark fuscous line, on lower half of hindmargin white except towards anal angle.

Hab. Fort Stedman; one specimen.

Distinct from all near allies by the orange band of abdomen.

7. *Margaronia principalis*, Walk.

Hab. Fort Stedman.

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8. *Botyodes asialis*, Gn.

Hab. Koni.

9. *Omiodes bianoralis*, Walk.

Hab. Koni.

10. *Omiodes vulgalis*, Gn.

Hab. Koni.

11. *Agrotera effertalis*, Walk.

Hab. Koni.

12. *Conogethes rigidalis*, Snell.

Hab. Fort Stedman.

13. *Conogethes plagiferalis*, Walk.

Hab. Fort Stedman.

14. *Conogethes boteralis*, Walk.

Hab. Mone, Fort Stedman.

15. *Conogethes amyntalis*, Walk.

Hab. Koni.

LOXOCORYS, n. g.

Face oblique, forming a rounded-conical projection beneath; a small erect scaletuft on crown between antennæ; ocelli distinct; tongue developed. Antennæ $\frac{3}{3}$, in ♂ stout, filiform, minutely ciliated ($\frac{1}{5}$). Labial palpi rather long, curved, ascending, shortly rough-scaled beneath, terminal joint moderate, loosely scaled, pointed. Maxillary palpi rather long, filiform. Abdomen in ♂ with moderate anal tuft. Forewings with vein 7 from near 8, 9 and 10 out of 8. Hindwings 1; veins 3, 4, 5 approximated at base, 7 out of 6 near origin, anastomosing with 8 to middle.

16. *Loxocorys sericea*, Butl. (*Scopula*).

Hab. Fort Stedman.

17. *Notarcha quaternalis*, Z.

Hab. Koni.

18. *Phlyctænia itemalesalis*, Walk.

Hab. Fort Stedman.

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19. *Phlyctænia ferrugalis*, Hb.

Hab. Mone.

20. *Hyalobathra dialychna*, sp. n.

♂. 20—21 mm. Head, palpi, antennæ, thorax, and abdomen pale brownish-ochreous; palpi $1\frac{2}{3}$, base white; antennal ciliations $1\frac{1}{4}$. Forewings with apex rectangular; brownish-ochreous, posterior half suffused with reddish-brown; lines indistinct, blackish-grey; first curved, indented in middle; a cloudy blackish-grey blotch in middle of disc; second line forming an oblique blackish mark on costa at $\frac{2}{3}$, obtusely bent above middle, below middle again bent inwards to beneath discal blotch, and thence again rectangularly bent to inner margin at $\frac{2}{3}$; a bright ochreous-yellow suffused blotch extending along apical third of costa; cilia white, with a blackish-grey basal line. Hindwings pale brownish-ochreous, towards costa whitish-ochreous; traces of a grey discal blotch and some blackish dots indicating second line as in forewings, but very indistinct; an indistinct fine waved blackish-grey subterminal line; cilia as in forewings.

Hab. Koni; two specimens.

21. *Isocentris illectalis*, Walk.

Hab. Koni.

22. *Pyrausta ablactalis*, Walk.

Hab. Fort Stedman.

23. *Pyrausta miniosalis*, Gn.

Hab. Fort Stedman.

24. *Pyrausta celatalis*, Walk.

Hab. Fort Stedman.

25. *Pyrausta extinctalis*, Christ.

Hab. Koni.

26. *Pyrausta abruptalis*, Walk.

Hab. Fort Stedman.

27. *Acharana otrealis*, Walk.

Hab. Koni, Fort Stedman.

28. *Titanio comparalis*, Hb.

Hab. Mone.

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29. *Titanio fessalis*, Swinh.

Hab. Koni.

Labial and maxillary palpi unusually long; frontal plate short, rounded; hindwings with veins 4 and 5 stalked.

30. *Hellula undalis*, F.

Hab. Koni.

31. *Metasia zanclogramma*, sp. n.

♀. 14—16 mm. Head, antennæ, thorax, and abdomen ochreous-whitish, shoulders irrorated or suffused with dark fuscous. Palpi white, terminal joint and apex of second dark fuscous. Legs whitish, anterior pair banded with dark fuscous. Forewings elongate-triangular, costa hardly arched, apex roundpointed, hindmargin sinuate; pale greyish-ochreous, more or less irrorated with fuscous; costa suffused with dark fuscous on basal half; lines dark fuscous; first from $\frac{1}{4}$ of costa to $\frac{1}{3}$ of inner margin, curved; two subquadrate spots outlined with dark fuscous in disc; a small blackish spot on costa beyond middle; second line rising from posterior extremity of a small longitudinal black mark on costa at $\frac{3}{4}$, preceded and followed by a clearer whitish-ochreous spot, running nearly straight to anal angle, slightly indented in middle, obsoletely continued upwards to lower margin of second discal spot, thence again distinct to $\frac{2}{3}$ of inner margin; a cloudy dark fuscous line along hindmargin from apex to near anal angle: cilia rather light fuscous, base whitish-ochreous. Hindwings with colour, second and hindmarginal lines as in forewings, but second line without costal spot; a small dark fuscous discal spot, connected with second line; cilia fuscous-whitish, with a fuscous subbasal line.

Hab. Koni; two specimens.

Very like some of the other small obscure species of the genus, but distinguished from all by the dark costal mark from which the second line rises.

METASIODES, n. g.

Characters of *Metasia*, but face without prominence, labial palpi ascending, terminal joint short, obtuse.

32. *Metasiodes heliaula*, sp. n.

♂ ♀. 15—18 mm. Head ochreous-whitish, with two fuscous spots before antennæ; frontal prominence hardly perceptible. Palpi

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white, terminal joint and apex of second dark fuscous. Antennæ whitish-ochreous, ciliations in ♂ ½. Thorax and abdomen ochreous-yellow. Legs whitish, anterior pair banded with dark fuscous. Forewings elongate-triangular, costa almost straight, apex round-pointed, hindmargin sinuate; bright yellow, more or less ferruginous-tinged; eight small blackish spots on costa, the sixth double and tending to form a semicircular ring; lines ferruginous, rather irregular; first at ⅓; two quadrate spots outlined with dark fuscous in disc, separated by a quadrate semitransparent whitish spot; second line waved, running from eighth costal spot near apex to anal angle, thence obsoletely continued to beneath second discal spot, and thence again distinct to ⅔ of inner margin; a thick dark fuscous line along upper ⅓ of hindmargin, preceded by a ferruginous suffusion; cilia yellowish, with blackish spots at apex and middle of hindmargin. Hindwings yellow; a small dark fuscous discal spot; second line as in forewings, but rising from ⅔ of costa; a ferruginous apical patch, bordered by a thick dark fuscous line along upper half of hindmargin: cilia as in forewings, sometimes with a cloudy dark grey subbasal line on upper half of hindmargin.

Hab. Koni, Fort Stedman; five specimens.

33. *Nacoleia contingens*, Moore.

Hab. Koni.

34. *Sameodes cancellalis*, Z.

Hab. Koni.

35. *Diasemia grammalis*, Dbld.

Hab. Koni.

36. *Bocchoris inspersalis*, Z.

Hab. Koni.

37. *Stegothyris diagonalis*, Gn.

Hab. Koni, Mone, Fort Stedman.

38. *Cnaphalocrocis medinalis*, Gn.

Hab. Mone.

39. *Dolichosticha venilialis*, Walk.

Hab. Fort Stedman

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40. *Dolichosticha marisalis*, Walk.

Hab. Koni.

41. *Dolichosticha perinephes*, Meyr.

Hab. Tabet.

42. *Pagyda salvalis*, Walk.

Hab. Koni.

43. *Filodes fulvidorsalis*, Hb.

Hab. Fort Stedman.

44. *Nausinoe onychinalis*, Gn.

Hab. Fort Stedman.

45. *Nausinoe geometralis*, Gn.

Hab. Fort Stedman.

46. *Siriocauta testulalis*, Hb.

Hab. Koni.

47. *Cataclysta mesorphna*, sp. n.

♂. 12 mm. Forewings dark fuscous; a moderate orange fascia at ¼, not reaching costa, preceded and followed by obscure pale leaden lines; apical area orange, indented by a long leaden-metallic wedge-shaped projection from costa beyond ⅔, and enclosing a leaden-metallic spot on anal angle, and a silvery-white narrow wedge-shaped fascia, margined with dark grey, from costa before apex to hind margin below middle: cilia dark fuscous-grey. Hindwings with vein 8 absent; dark fuscous, sprinkled with white in disc; a longitudinal orange streak near inner margin; a slender whitish curved transverse line beyond ⅔; four rather large round black spots on hindmargin, separated by orange hindmarginal dots surmounted by golden-metallic scales, first and fourth spots including central golden-metallic spots; cilia fuscous, base darker.

Hab. Koni; one specimen.

48. *Nymphula bifurcalis*, Pryer.

Hab. Fort Stedman.

49. *Nymphula turbata*, Butl.

Hab. Fort Stedman.

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50. *Nymphula myina*, Meyr.

Hab. Koni.

51. *Nymphula fluctuosalis*, *Z.*

Hab. Koni.

52. *Nymphula depunctalis*, Gn.

Hab. Koni.

53. *Mixophyla erminea*, Moore.

Hab. Fort Stedman.

54. *Crambostenia angustifimbrialis*, Swinh.

Hab. Fort Stedman.

55. *Donacaula chlorosema*, sp. n.

♂. 17—20 mm. Head, antennæ, thorax, and abdomen white; antennæ subdentate, ciliations ½. Labial palpi 1½, fuscous. Maxillary palpi fuscous, apex white. Legs fuscous, posterior tibiæ white. Forewings elongate-triangular, hindmargin rather strongly rounded beneath; 11 running into 12; white; markings pale ochreous-yellow, faint and cloudy; two or three small spots in disc near base; first line at ⅓, bent above middle, partially interrupted; two spots on costa beyond middle, one at ⅔, and an erect mark from inner margin before anal angle, with some faint scattered scales in disc between these: cilia white. Hindwings white; a small pale ochreous-yellow spot at anal angle; cilia white.

Hab. Koni; two specimens.

56. *Schœnobius punctellus*, *Z.*

Hab. Koni.

57. *Scirpophaga xanthogastrella*, Walk.

Hab. Fort Stedman

PYRALIDIDÆ.

58. *Herculia psamathopis*, sp. n.

♂. 27—31 mm. Head, thorax, and abdomen light brownish-ochreous, crown more yellow-ochreous. Antennal ciliations 1½. Forewings with costa slightly sinuate, apex obtuse, hindmargin rounded, oblique; light brownish-ochreous, irrorated with fuscous;

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first line faintly darker, almost obsolete ; second line thick, very cloudy, fuscous, from ¾ of costa to before ¾ of inner margin, somewhat sinuate : cilia light brownish-ochreous, with cloudy fuscous lines. Hindwings with colour as in forewings, but lighter, hairs in disc towards base reddish ; second line as in forewings, but more distinct, somewhat curved ; cilia as in forewings.

Hab. Koni ; two specimens.

59. *Pyralis vibicalis,* Ld.

Hab. Koni.

60. *Pyralis pictalis,* Curt.

Hab. Tabet, Koni.

PROSARIS, n. g.

Face with projecting tuft of scales ; ocelli distinct ; tongue developed. Antennæ ¾, in ♂ serrulate, ciliated (2). Labial palpi long, porrected, curved downwards, clothed beneath throughout with very long dense loosely-appressed hairs, terminal joint moderately long. Maxillary palpi rather short, thick, triangularly dilated with scales. Abdomen in ♂ with moderate anal tuft. Anterior femora in ♂ with tuft of hairs beneath ; middle and posterior tibiæ and first joint of tarsi in ♂ clothed with long rough hairs. Forewings with vein 1 shortly furcate, 7 and 8 out of 9. Hindwings in ♂ above with an erect triangular tuft of scales below middle, beneath with a large bladderlike swelling on vein 8 towards base ; 7 out of 6, anastomosing very shortly with 8.

61. *Prosaris pernigralis,* Rag. (?)

♂. 21 mm. Head reddish ochreous, face mixed with dark fuscous. Palpi dark reddish-fuscous. Thorax dark fuscous mixed with ochreous, purplish-tinged. Forewings triangular, costa nearly straight, hardly sinuate in middle, apex obtuse, hindmargin bowed rather oblique ; deep purplish-reddish-fuscous, irrorated with blackish ; hindmarginal area lighter and greyer ; a suffused deep red patch towards costa near apex, surrounding a small clear whitish-ochreous spot on costa : cilia deep purple-reddish, mixed with blackish. Hindwings with colour and cilia as in forewings ; discal scaletuft blackish, followed by a deep reddish suffusion, including a suffused whitish-ochreous dot ; a suffused blackish shade at ¾, parallel to hindmargin.

Hab. Koni ; one specimen.

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M. Ragonot described his *pernigralis* from a single ♀; hence he was not acquainted with the full generic characters, and his specific description also differs in some particulars, which are probably sexual; I have, therefore, described my ♂ in full, but I have little doubt that it is truly identical with his species.

62. *Hyboloma nummosalis*, Rag.

Hab. Koni.

M. Ragonot's figure is poor; the ocelli are present; the face has a projecting tuft of scales; in the forewings vein 6 rises out of 7, but this character is very probably inconstant.

SICULODIDÆ.

63. *Striglina idalialis*, Walk.

Hab. Mone.

64. *Siculodes subrosealis*, Leech.

Hab. Fort Stedman.

PHYCITIDÆ.

65. *Heteroglypta ephippella*, Rag.

Hab. Koni, Mone.

66. *Myelois robusta*, Moore.

Hab. Koni.

67. *Rhodophœa duplicella*, Rag.

Hab. Koni.

68. *Canthelea gratella*, Walk.

Hab. Koni.

69. *Piesmopoda steniella*, Rag.

Hab. Koni.

70. *Dera spurcella*, Rag.

Hab. Koni.

71. *Etiella zinckenella*, Tr.

Hab. Koni.

72. *Critonia subconcinnella*, Rag.

Hab. Koni.

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GALLERIADÆ.

73. *Lamoria planalis*, Walk.

Hab. Koni.

74. *Lamoria rufivena*, Walk.

Hab. Fort Stedman.

CRAMBIDÆ.

75. *Aquita torrentella*, Meyr. (?)

Hab. Koni; the single specimen differs somewhat from those originally described from Australia, but I cannot venture to separate it specifically.

76. *Surattha invectalis*, Walk.

Hab. Mone.

77. *Ancylolomia indica*, Feld.

Hab. Koni.

78. *Ptychopseustis amœnella*, Snell.

Hab. Koni.

TINEINA.

GELECHIADÆ.

1. *Anacampsis scutata*, sp. n.

♂. 12 mm. Head and thorax ochreous, face and palpi whitish-ochreous. Antennæ fuscous-whitish. Forewings elongate, narrow, costa gently arched, apex round-pointed, hind margin oblique, hardly rounded; dark slaty-fuscous; a moderately broad whitish-ochreous streak along inner margin from base to $\frac{3}{4}$, pointed posteriorly; a moderate triangular ochreous-white spot on costa about $\frac{4}{5}$; some whitish dots round apical margin: cilia dark slaty-fuscous. Hindwings and cilia whitish-grey, slightly purplish-tinged.

Hab. Fort Stedman; one specimen.

HIERANGELA, n. g.

Head smooth; ocelli absent; tongue developed. Antennæ $\frac{2}{3}$, in ♂ serrulate, simple, basal joint slender, without pecten. Labial palpi very long, recurved, smooth, slender, second joint somewhat thickened, terminal joint longer than second, acute. Maxillary

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palpi rudimentary. Posterior tibiæ clothed with hairs. Forewings with vein 1b furcate, 2 from before angle, 8 and 9 out of 7, 7 to costa (?), 11 from beyond middle. Hindwings $\frac{4}{5}$, narrow, parallel-sided, apex strongly and acutely produced, hindmargin beneath apex straight, oblique, cilia 3; veins 3 and 4 from a point, 6 and 7 from a point.

2. *Hierangela erythrogramma*, sp. n.

♂. 14 mm. Head yellow, with red central streak on crown, face white. Palpi whitish, second joint red above towards apex. Antennæ whitish-ochreous, towards base reddish above. Thorax yellow, with four longitudinal red stripes. Abdomen pale grey. Forewings very elongate, broadest near base, thence gradually narrowed to apex, acute; bright yellow; a crimson-red costal streak from base to $\frac{3}{4}$, paler posteriorly, leaving extreme costal edge whitish; a longitudinal median crimson-red streak from base to costa before apex, interrupted at $\frac{3}{4}$; space between this and costal streak suffused with fuscous; a small fuscous spot on lower margin of median streak before middle; a transverse crimson-red spot from inner margin near base, meeting median streak; a small red spot on inner margin beyond this; a crimson-red streak along inner margin from before middle to apex, interrupted above anal angle and below apex: cilia grey, on costa pale ochreous, with a blackish apical hook and a small golden-metallic subbasal spot at apex, base beneath apex reddish. Hindwings and cilia grey, towards anal angle whitish-grey.

Hab. Fort Stedman; one specimen.

3. *Cladodes arotraea*, sp. n.

♀. 11—14 mm. Head and thorax whitish-ochreous, with three fuscous stripes. Palpi whitish-ochreous, with a dark fuscous line on each side of anterior edge. Antennæ whitish-ochreous, spotted with fuscous. Forewings elongate, narrow, costa gently arched, apex pointed, hindmargin almost straight, oblique; pale whitish-ochreous, all veins suffusedly margined with dark fuscous; a round black dot in disc at $\frac{2}{5}$, a second nearly beneath it on fold, and a third in disc at $\frac{3}{5}$; a small suffused blackish apical spot; cilia pale whitish-ochreous, with an indistinct fuscous line. Hindwings pale grey; cilia grey-whitish.

Hab. Koni; two specimens.

ONEBALA, Walk.

Head smooth; ocelli almost concealed; tongue developed. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint moderate, without pecten.

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Labial palpi very long, recurved, smooth, second joint rather thickened above middle, terminal joint as long as second, slender, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with hairs above. Forewings with vein 1b furcate, 2 almost from angle, 3 and 4 stalked, 5 absent, 7 to costa, 8 and 9 out of 7, 11 from beyond middle. Hindwings somewhat over 1, trapezoidal, hindmargin not indented, cilia $\frac{3}{4}$; veins 3 and 4 stalked, 5 absent, 6 and 7 stalked.

Near *Cladodes;* Walker's description is of course inadequate.

4. *Onebala blandiella,* Walk.

Hab. Mone; one specimen. Walker's type is from Ceylon, and differs slightly in marking.

TORODORA, n. g.

Head smooth, sidetufts somewhat spreading; ocelli absent; tongue developed. Antennæ $\frac{5}{6}$, in ♂ serrate, ciliated ($\frac{3}{4}$–1), basal joint rather long, without pecten. Labial palpi long, recurved, second joint much thickened with appressed scales, somewhat rough beneath, terminal joint as long as second, slender, acute. Maxillary palpi very short. Posterior tibiæ clothed with rough hairs, posterior tarsi sometimes with basal joint rough-haired above. Forewings with vein 1b furcate, 2 and 3 stalked from angle, 7 and 8 stalked, 7 to apex or just below, 9 out of 7 or in ♀ sometimes separate, 11 from beyond middle. Hindwings over 1, trapezoidal, hindmargin more or less sinuate, cilia $\frac{1}{2}$–$\frac{2}{3}$; veins 3 and 4 from a point, 5 approximated to 4 at base, 6 and 7 stalked.

Allied to *Lecithocera.* The three species described are very similar, but certainly distinct. Type, *T. characteris.*

5. *Torodora characteris,* sp. n.

♂ ♀. 18—22 mm. Head and thorax dark fuscous. Palpi whitish-ochreous, second joint dark fuscous except apex. Antennæ whitish-ochreous, sharply serrate, ciliations 1. Abdomen fuscous. Posterior tarsi with basal joint hairy. Forewings elongate, costa gently arched, apex obtuse, hindmargin sinuate, hardly oblique; 7 to apex; rather dark fuscous; a rather irregular black spot or small blotch on submedian fold before $\frac{1}{3}$ of wing, connected with inner margin by an indistinct darker suffusion; a small transverse black spot in disc beyond middle; a faintly indicated slightly bent pale transverse line about $\frac{4}{5}$: cilia fuscous, base pale ochreous. Hindwings rather light fuscous; cilia as in forewings.

Hab. Koni; two specimens.

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6. *Torodora parallactis*, sp. n.

♂. 24 mm. Differs from *T. characteris* as follows: (terminal joint of palpi broken) antennæ yellowish-tinged, less serrate, ciliations $\frac{3}{4}$; posterior tarsi not rough-haired; forewings with vein 7 to below apex, anterior blotch triangular, more distinctly connected with inner margin, followed by some whitish-ochreous scales, posterior spot absent, replaced by two transversely placed whitish-ochreous dots; hindwings paler, cilia more ochreous.

Hab. Mone; one specimen.

7. *Torodora ancylota*, sp. n.

♀. 19 mm. Head and thorax whitish-ochreous, tinged with pale brown-reddish. (Palpi and antennæ broken.) Forewings elongate, costa slightly arched, apex strongly produced, pointed, hindmargin hence concave, rather oblique; 7 to below apex, 9 out of 7; ochreous-fuscous, irrorated with dark fuscous; extreme costal edge yellowish; a small black spot at base of costa; an erect black bar from inner margin at $\frac{1}{3}$, reaching $\frac{2}{3}$ across wing, dilated on submedian fold; a small black spot on costa at $\frac{2}{5}$; two dark fuscous dots transversely placed in disc beyond middle; a paler bent transverse line, preceded by a darker suffusion, faintly indicated at $\frac{4}{5}$: cilia pale fuscous, base whitish-ochreous. Hindwings with apex more pointed, hindmargin more sinuate than in the other species; light fuscous; cilia as in forewings.

Hab. Fort Stedman; one specimen.

The peculiar shape of wing easily separates this species from the others.

8. *Lecithocera luticornella*, Z.

Hab. Koni; one specimen.

9. *Lecithocera pachyntis*, sp. n.

♂. 13—14 mm. Head fuscous, sides of crown ochreous-yellow. Palpi pale yellowish-ochreous, sometimes partially suffused with fuscous. Antennæ as long as forewings, lower half thickened with scales, much more strongly near base, ochreous-yellowish, upper half annulated with dark fuscous. Thorax and abdomen ochreous-fuscous. Forewings elongate, costa slightly arched, apex obtuse, hindmargin obliquely rounded; vein 9 separate; fuscous; a black dot in disc at $\frac{1}{3}$, and another at $\frac{2}{3}$: cilia light ochreous, with two fuscous lines. Hindwings rather light fuscous; cilia pale ochreous.

Hab. Koni; two specimens.

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Zalithia, n. g.

Head smooth; ocelli present; tongue developed. Antennæ $\frac{5}{6}$, in ♂ — , basal joint slender, without pecten. Labial palpi long, recurved, smooth, second joint rather thickened, terminal joint slender, acute. Maxillary palpi very short. Posterior tibiæ with somewhat rough scales. Forewings with vein 1b furcate, 2 and 3 stalked, 7 and 8 stalked, 7 to costa, 11 from middle. Hindwings over 1, oblong-ovate, cilia $\frac{1}{2}$; veins 3 and 4 from a point, 5 parallel to 4, 6 and 7 closely approximated at base.

10. Zalithia [illegible], sp. n.

♀. 15 mm. Head dark fuscous, with bright blue reflections, face brassy-ochreous. Palpi ochreous-yellow, anterior edge of terminal joint fuscous. Antennæ dark fuscous, spotted with whitish-yellowish. Thorax dark fuscous, with three blue lines. Abdomen dark fuscous, beneath pale whitish-ochreous. Forewings elongate, rather narrow, costa slightly arched, apex rounded, hindmargin rather obliquely rounded; orange-ferruginous, apical $\frac{2}{5}$ coppery-blackish; markings bright metallic green-blue; a streak along anterior half of costa; a streak along submedian fold from base to middle of wing; a rather narrow fascia separating the ferruginous and black portions, interrupted below middle and not reaching inner margin; an irregular apical fascia, broken into spots on lower part of hindmargin; cilia fuscous, basal half orange-ferruginous round apex, with a black sublobal line. Hindwings dark fuscous, darker and somewhat coppery-tinged on posterior half; cilia blackish-grey, terminal half whitish except towards apex and anal angle.

Hab. Koni; one specimen.

Tipha, Walk.

Head smooth; ocelli present; tongue developed. Antennæ with more or less strong thickening or nodosity near base, rough-scaled above. Labial palpi moderately long, curved, ascending, second joint with appressed scales, dilated and somewhat tufted at apex, terminal joint very short (?), loosely scaled. Maxillary palpi very short. Posterior tibiæ rough-haired. Forewings with cell extremely narrow, 1b furcate, 2 and 3 stalked from angle, 4 absent, 5 absent, 8 and 9 out of 7, 7 to costa, 11 from $\frac{3}{4}$. Hindwings over 1, elongate-ovate, cilia $\frac{1}{2}$; in ♂ with membranous thickening along basal third of costa, with a tuft of long hairs lying along it on upper surface; veins 3 and 4 stalked from angle, 5 absent, in ♀ 6 and 7

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stalked, in ♂ 6 absent and cell narrowed and pointed posteriorly, so that 7 rises from a point with stalk of 3 and 4.

I do not possess Walker's typical species, and the specimens of the following species are partly damaged; hence the above generic characters are not quite complete, but sufficiently so to show the great peculiarity of the structure. The genus is distinctly allied to *Zalithia*.

11. *Tipha helioclina*, sp. n.

♂ ♀. 20—22 mm. Head shining pale ochreous. Thorax metallic leaden-grey. Forewings elongate, narrow, costa gently arched, apex obtuse, hindmargin obliquely rounded; bright orange; a dark leaden-metallic streak along inner margin from ¼ to base, thence along costa to ⅓, whence it crosses the wing in a rather strong curve to middle of inner margin; a large bronzy-purplish-fuscous patch occupying apical area, its anterior edge forming a very strong rounded angulation which reaches to middle of wing; cilia brassy-metallic. Hindwings and cilia rather dark purplish-fuscous.

Hab. Fort Stedman; two specimens.

XYLORYCTIDÆ.

PTOCHORYCTIS, n. g.

Head with appressed scales, sidetufts loosely spreading; ocelli present; tongue developed. Antennæ ¾, in ♂ bipectinated, towards apex simple, basal joint stout, without pecten. Labial palpi long, curved, ascending, with appressed scales, terminal joint shorter than second, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with long hairs. Forewings with vein 1b furcate, 2 from ⅘, 7 and 8 stalked, 7 to hindmargin, 9 absent, 11 from beyond middle. Hindwings 1, trapezoidal-ovate, hindmargin sinuate, cilia ½; veins 3 and 4 short-stalked, 6 and 7 approximated towards base.

Nearly allied to *Cryptophasa*.

12. *Ptochoryctis eremopa*, sp. n.

♂. 17 mm. Head, palpi, antennæ, thorax, and abdomen whitish-ochreous; antennal pectinations blackish. Forewings elongate, costa slightly arched, apex obtuse, hindmargin slightly rounded, rather strongly oblique; whitish-ochreous, on posterior half thinly sprinkled with ochreous-brown; inner margin indistinctly suffused with ochreous-fuscous: cilia ochreous-whitish, with two cloudy ochreous-brownish lines. Hindwings light grey; cilia as in forewings.

Hab. Koni; one specimen.

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TRICHERNIS, n. g.

Head with appressed scales, sidetufts loosely spreading and projecting between antennæ; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ with long fine cilia (3), basal joint moderate, without pecten. Labial palpi long, curved, ascending, second joint thickened with appressed scales, terminal joint shorter than second, slender, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with long rough hairs. Forewings with vein 1b furcate, 2 from angle, 7 and 8 stalked, 7 to hindmargin, 11 from middle. Hindwings 1, oblong-ovate, cilia $\frac{3}{4}$; veins 3 and 4 stalked 5 approximated to 3 at base, 6 and 7 stalked.

13. *Trichernis centrias*, sp. n.

♂. 15 mm. Head and thorax pale ochreous-yellowish. Palpi whitish-ochreous, second joint dark fuscous externally except at apex. Abdomen whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex obtuse, hindmargin straight, rather oblique; pale ochreous-yellowish; a round black discal dot beyond middle: cilia pale ochreous-yellowish. Hindwings and cilia whitish-ochreous.

Hab. Koni; one specimen.

DEPRESSARIADÆ.

14. *Phæosaces torrida*, sp. n.

♂ ♀. 22—25 mm. Head and palpi ochreous-yellow, terminal joint of palpi in ♂ $\frac{1}{2}$, stout, in ♀ $\frac{3}{4}$, slender. Thorax light ochreous-fuscous, in ♂ paler and more yellowish. Abdomen fuscous, margins yellowish. Forewings elongate-oblong, costa moderately arched, apex obtuse, hindmargin nearly straight, rather oblique; in ♂ unicolorous light ochreous-yellowish; in ♀ rather light ochreous-brown, apex and costa more or less suffused with ochreous-yellow: cilia ochreous-yellowish. Hindwings rather dark fuscous, in ♂ lighter and somewhat suffused with ochreous-yellowish; cilia ochreous-yellowish, in ♀ base suffused with fuscous.

Hab. Koni; three specimens.

HOMOSACES, n. g.

Head with appressed scales, sidetufts loosely spreading; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ stout, filiform, simple, basal joint moderate, without pecten. Labial palpi long, curved, ascending, with appressed scales, terminal joint shorter than second, acute. Maxillary palpi rudimentary. Posterior

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tibiæ clothed with long rough hairs. Forewings with vein 1b furcate, 2 and 3 stalked, 7 and 8 stalked, 7 to hindmargin, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{3}{4}$; veins 3 and 4 from a point.

Allied to *Phœosaces*.

15. *Homosaces anthocoma*, sp. n.

♂ ♀. 15—17 mm. Head and palpi yellow-ochreous, palpi externally infuscated. Antennæ, thorax, and abdomen dark fuscous. Forewings elongate, moderate, costa gently arched, apex obtuse, hindmargin rather obliquely rounded; dark fuscous, faintly purplish-tinged; cilia dark fuscous. Hindwings and cilia dark fuscous.

Hab. Koni; five specimens.

Periacma, n. g.

Head with appressed scales, sidetufts loosely spreading; ocelli concealed; tongue developed. Antennæ almost 1, in ♂ filiform, simple, basal joint moderately long, without pecten. Labial palpi long, curved, ascending, thickened with appressed scales, second joint short, terminal joint thrice as long as second, pointed. Maxillary palpi rudimentary. Posterior tibiæ clothed with rough hairs. Forewings with vein 1b furcate, 2 from near angle, 7 and 8 stalked, 7 to apex, 1*b* from middle. Hindwings under 1, very elongate-ovate, cilia 1; veins 3 and 4 from a point.

Specially characterised by the peculiar structure of the labial palpi. Type, *P. ferialis*.

16. *Periacma ferialis*, sp. n.

♂. 13—14 mm. Head, palpi, and thorax light orange; second joint of palpi mixed with dark fuscous externally, terminal joint with a dark fuscous apical spot. Antennæ ochreous-yellowish, spotted with dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; bright orange; markings dark slaty-purplish; a streak along submedian fold from near base to middle of wing, tending to coalesce with a spot above its middle, and an oblique bar from inner margin near base; a narrow slightly curved fascia from $\frac{2}{3}$ of costa to anal angle; an apical spot, sometimes ill-marked; cilia orange, becoming pale whitish-ochreous towards anal angle. Hindwings grey; cilia whitish-ochreous, towards base greyish-tinged.

Hab. Koni; two specimens.

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17. *Periacma orthiodes*, sp. n.

♂. 15 mm. Head, palpi, and thorax rather deep ochreous-yellow. Antennæ grey. Abdomen ochreous-yellowish. Forewings elongate, moderate, costa gently arched, apex obtuse, hindmargin nearly straight, oblique; orange-yellow; markings rather dark purplish-fuscous; an oblique spot from inner margin near base; a streak along submedian fold from near base to middle of wing, with a spot above its middle; a narrow slightly curved fascia from $\frac{3}{5}$ of costa to anal angle; a hindmarginal fascia, moderate at apex, narrowed to a point at anal angle; cilia orange-yellow, tips whitish-yellowish, at anal angle purplish-tinged. Hindwings grey; cilia yellowish, towards anal angle greyish.

Hab. Koni; one specimen. Very similar to the preceding, but certainly distinct by the different form of wing, unspotted palpi, grey antennæ, and yellow abdomen.

18. *Periacma chlorodesma*, sp. n.

♂. 13 mm. Head orange-yellow, face and palpi whitish-ochreous. Antennæ dark grey, base whitish-ochreous. Thorax rather dark purplish-grey. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, costa moderately arched, apex obtuse, hindmargin oblique, slightly rounded; rather dark fuscous, slightly purplish-tinged; a whitish-ochreous streak along anterior half of costa, meeting a narrow straight ochreous-whitish fascia which runs from costa beyond middle to inner margin before anal angle; a suffused ochreous-yellow streak along apical portion of costa and upper half of hindmargin; cilia ochreous-yellow, at anal angle dark fuscous. Hindwings grey; cilia light ochreous-yellowish.

Hab. Koni; one specimen.

ŒCOPHORIDÆ.

19. *Psecadia hilarella*, Walk.

Hab. Fort Stedman.

BLASTOBASIDÆ.

ARCTOSCELIS, n. g.

Head smooth; ocelli absent; tongue developed. Antennæ $\frac{4}{5}$, in ♂ serrulate, shortly ciliated, basal joint moderate, without pecten. Labial palpi long, curved, ascending, second joint with appressed scales, somewhat rough beneath towards apex, terminal joint

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shorter than second, slightly roughened in front, acute. Maxillary palpi obsolete. Posterior tibiæ and basal joint of tarsi with extremely long spreading erect spatulate hair-scales. Forewings with vein 1b furcate, 2 from $\frac{4}{5}$, 7 and 8 stalked, 7 to hindmargin, 11 from before middle. Hindwings $\frac{3}{4}$, lanceolate, cilia 2; veins 3 and 4 stalked, 5 absent.

20. *Arctoscelis epinyctia*, sp. n.

♂. 11 mm. Head ochreous-white, crown sprinkled with fuscous. Palpi whitish, externally mixed with fuscous. Antennæ ochreous-whitish. Thorax dark fuscous, somewhat mixed with whitish. Forewings elongate, rather narrow, costa moderately arched, apex pointed, hindmargin extremely obliquely rounded; fuscous, closely irrorated with dark fuscous; a white dot in disc before $\frac{2}{3}$: cilia rather dark fuscous. Hindwings light fuscous, closely irrorated with dark fuscous; cilia rather dark fuscous.

Hab. Koni; one specimen.

ELACHISTIDÆ.

21. *Cosmopteryx asiatica*, Stt.

Hab. Fort Stedman.

Placoptila, n. g.

Head smooth; ocelli absent; tongue developed. Antennæ almost 1, in ♂ shortly ciliated, basal joint elongate, without pecten. Labial palpi very long, recurved, smooth, slender, terminal joint longer than second, acute. Maxillary palpi rudimentary. Abdomen in ♂ with claspers very large, exposed, their base covered above by a flat plate of expanded scales. Posterior tibiæ smooth-scaled, with whorls of scales at origin of spurs. Forewings with vein 1b furcate, 2 from $\frac{4}{5}$, 6 absent, 7 to costa, 11 from middle. Hindwings $\frac{3}{4}$, narrow-lanceolate, cilia 4; veins 6 and 7 stalked.

Nearly allied to *Cosmopteryx*.

22. *Placoptila electrica*, sp. n.

♂. 11—12 mm. Head, palpi, and thorax dark silvery-grey; eyes crimson. Antennæ and abdomen dark grey. Forewings elongate, very narrow, pointed; blackish; markings violet-silvery-metallic; base suffused with dark silvery-grey; a straight slender fascia at $\frac{1}{3}$, dilated below middle; two small marginal opposite spots at $\frac{3}{5}$; a small spot on anal angle, and another beyond it on costa;

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space between these and preceding pair sometimes distinctly bronzy; cilia blackish, at apex with a white spot on tips.

Hab. Koni; four specimens.

HYPONOMEUTIDÆ.

23. *Cerace stipatana*, Walk.

Hab. Koni. I believe this genus is usually referred to the *Tortricina*, but it properly belongs here, and is allied to *Oeta*.

COMOCRITIS, n. g.

Head with appressed scales, sidetufts loosely spreading, projecting between antennæ; ocelli present; tongue developed. Antennæ $\frac{2}{3}$, in ♂ shortly bipectinated, with streak of rough scales on back near base, basal joint large, with dense pecten. Labial palpi moderate, curved, ascending, second joint loosely scaled, terminal joint less than half second, pointed. Maxillary palpi very short, filiform. Posterior tibiæ clothed with rough scales. Forewings with vein 1b furcate, 2 from near angle, 7 to costa, 11 from middle, with a subhyaline groove on lower surface beneath 12 towards base. Hindwings 1, elongate-ovate, cilia $\frac{1}{4}$; veins 3 and 4 from a point, 5 and 6 somewhat approximated at base.

Allied to *Oeta*, but not closely.

24. *Comocritis olympia*, sp. n.

♂. 30 mm. Head, palpi, and thorax white. Abdomen grey. Forewings elongate, moderate, costa rather strongly arched, apex rounded, hindmargin obliquely rounded; rather light ochreous-grey, densely mixed with blackish-grey; a white basal fascia; a broad white costal streak throughout, suddenly narrowed near base, lower edge cloudy and shaded off with blue-whitish, interrupted by a light ochreous spot on costa at $\frac{2}{3}$; a longitudinal yellow-ochreous patch, marked with blackish lines on veins, extending through lower part of disc from near base to $\frac{3}{4}$; a crescentic white spot in disc at $\frac{2}{3}$, and a second, slightly ochreous-tinged, at $\frac{5}{6}$; a triangular white spot on anal angle: cilia white, with a light fuscous patch on lower part of hindmargin. Hindwings grey, apex white; cilia grey, round apex white.

Hab. Koni; one specimen.

PLUTELLIDÆ.

25. *Plutella cruciferarum*, Z.

Hab. Koni.

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GRACILARIADÆ.

26. *Gracilaria chalcanthes*, sp. n.

♂. 12—13 mm. Head shining whitish-ochreous, mixed with ochreous, face silvery-white. Palpi white. Antennæ white, annulated with dark fuscous. Thorax pale ochreous-yellowish. Abdomen pale grey. Anterior and middle legs dark fuscous, tarsi white; posterior legs white, femora with a dark fuscous band. Forewings elongate, very narrow, parallel-sided, pointed; ochreous, towards costa tinged, or costal $\frac{2}{3}$ wholly suffused with light brassy-yellow; margins marked with scattered black dots, mostly minute; a black dot in disc before $\frac{1}{3}$, and another beyond middle: cilia pale ochreous-greyish, round apex ochreous, with rows of black points on terminal half. Hindwings rather dark grey; cilia light grey.

Hab. Koni; two specimens.

ANTIOLOPHA, n. g.

Head smooth; no ocelli; tongue developed. Antennæ $1\frac{1}{4}$, basal joint moderate, without pecten. Labial palpi moderately long, arched, subascending, second joint smooth, terminal joint as long as second, acute, with a triangular tuft of scales in front above middle. Maxillary palpi moderately long, slender, arched, porrected, acute. Middle tibiæ thickened with scales; posterior tibiæ rough-scaled towards apex. Forewings with vein 1b furcate, 2 from $\frac{4}{5}$, 7 to costa, 8 absent, 11 from $\frac{4}{5}$. Hindwings $\frac{2}{3}$, linear-lanceolate, cilia 5; veins 5 and 6 stalked.

Nearly allied to *Gracilaria*, from which it differs essentially by the tufted terminal joint of palpi.

27. *Antiolopha hemiconis*, sp. n.

♀. 8—9 mm. Head and thorax white. Palpi white, apex of second and tuft of terminal joint black. Antennæ white, annulated with fuscous. Abdomen grey. Legs ochreous, anterior and middle tibiæ suffused with blackish, tarsi white with cloudy ochreous bands and apex of joints blackish. Forewings elongate, very narrow, parallel-sided, pointed; light reddish-brown; anterior half of inner margin suffused with ochreous-whitish; a triangular blotch on middle of costa faintly outlined with blackish scales, and more or less distinctly tinted with whitish: cilia grey-whitish, on hindmargin with basal half pale brown-reddish, and four rows of black points on terminal half. Hindwings rather dark grey; cilia light grey.

Hab. Koni; two specimens.

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TINEIDÆ.

28. *Adela satrapodes*, sp. n.

♀. 16 mm. Head ferruginous, face indigo-blue. Palpi and antennæ violet-black. Thorax metallic indigo-blue. Forewings moderate, posteriorly dilated, costa moderately arched, apex obtuse, hindmargin very obliquely rounded; deep shining indigo-blue; a broad bright orange fascia before middle, finely black-margined; some scattered black scales beyond this, tending to form a transverse parallel line: cilia indigo-blue, tips round apex violet. Hindwings deep purple; cilia bronzy-fuscous.

Hab. Fort Stedman; two specimens.

29. *Melasina invariella*, Walk. (*Torna*).

Hab. Koni.

30. *Melasina ochrocoma*, sp. n.

♂ ♀. 22—26 mm. Head pale yellow-ochreous, face fuscous. Palpi dark fuscous, apex whitish-ochreous. Antennæ fuscous, pectinations in ♂ 6, in ♀ 2. Thorax and abdomen fuscous. Forewings rather elongate, somewhat dilated posteriorly, apex obtuse, hindmargin rather oblique; light fuscous, mixed with whitish-fuscous and darker fuscous, tending to form faint strigulæ; a darker fuscous suffusion tending to form a basal patch, a transverse spot from inner margin beyond middle, and a fascia from costa beyond middle to anal angle, but all very faint and sometimes obsolete: cilia whitish-fuscous, with a cloudy fuscous line. Hindwings fuscous, in ♀ paler; cilia as in forewings.

Hab. Koni, Mone; six specimens.

It belongs to the group called *Alavona* by Walker, which I do not think sufficiently distinct to be separated from *Melasina*; from its nearest allies it is separated by the yellowish head.

Thisizima, Walk.

Head rough-haired; ocelli present; tongue obsolete. Antennæ over 1, broadly and flatly compressed, joints closely set, simple in both sexes, basal joint short, without pecten. Labial palpi rather long, curved, ascending, second joint with dense more or less roughly projecting scales or hairs beneath, with some long bristles near apex, terminal joint shorter than second, with appressed

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scales, pointed. Maxillary palpi obsolete. Posterior tibiæ shortly rough-scaled. Forewings with vein 1b furcate, 2 almost from angle, 7 to apex, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{2}{3}$; veins tolerably parallel.

31. *Thisizima ceratella*, Walk.

Hab. Koni.

32. *Thisizima antiphanes*, sp. n.

♂. 13 mm. Head, palpi, and antennæ pale yellow-ochreous. Thorax and abdomen dark fuscous. Forewings elongate, costa moderately arched, apex rounded, hindmargin obliquely rounded; dark fuscous, with coppery-purple reflections; a moderate straight yellowish-white fascia from $\frac{1}{4}$ of costa to $\frac{2}{3}$ of inner margin, somewhat widened downwards; a moderate yellowish-white spot on costa before apex: cilia dark fuscous. Hindwings and cilia dark fuscous.

Hab. Mone; one specimen.

33. *Scardia tholerodes*, sp. n.

♂. 16—20 mm. Head light ochreous-yellowish. Palpi light yellowish, mixed with dark fuscous, second joint with short rough projecting scales. Antennæ whitish-fuscous, towards base darker. Thorax fuscous mixed with dark fuscous and whitish-ochreous. Forewings elongate, costa moderately arched, apex rounded, hindmargin very obliquely rounded; 7 and 8 stalked, 9 absent; whitish-ochreous, with scattered strigulæ of mixed fuscous and dark fuscous scales; the confluence of these forms a suffused basal patch, an oblique cloudy fascia before middle, and a fascia from beyond middle of costa to anal angle: cilia whitish-ochreous mixed with dark fuscous. Hindwings pale grey, indistinctly irrorated with darker; cilia whitish-ochreous, with a cloudy grey line.

Hab. Koni; three specimens.

34. *Blabophanes monachella*, Hb. (*longella*, Walk.).

Hab. Koni.

It appears to me that the head of Walker's *longella* is not yellow as alleged, and that it does not in any way differ from *monachella*, which I have also recorded from the Hawaiian Islands.

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35. *Tinea platyntis*, sp. n.

♂♀. 15—20 mm. Head light ochreous-orange. Palpi dark fuscous mixed with ochreous. Antennæ whitish-ochreous. Thorax light ochreous, anteriorly purplish-tinged. Abdomen light ochreous. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; yellow-ochreous; costal edge infuscated towards base: cilia yellow-ochreous. Hindwings bronzy-grey; cilia whitish-grey.

Hab. Mone, Koni; three specimens. Also from Mooltan in the Punjab.

36. *Tinea liomorpha*, sp. n.

♂. 14 mm. Head light ochreous-yellowish. Palpi fuscous. Antennæ whitish-ochreous. Thorax fuscous-purplish. Abdomen light greyish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex roundpointed, hindmargin very obliquely rounded; purplish-fuscous: cilia purplish-fuscous. Hindwings with veins 3 and 4 from a point; light fuscous, with brassy reflections; cilia pale whitish-fuscous.

Hab. Mone; one specimen.

The neuration of the hindwings is exceptional, but perhaps not constant.

Saridoscelis, n. g.

Head rough-haired, face smooth; ocelli present; tongue developed. Antennæ $\frac{2}{3}$, basal joint moderate, with pecten. Labial palpi rather long, slightly curved, porrected, slender, anterior edge slightly rough, terminal joint as long as second, pointed. Maxillary palpi short, porrected, filiform. Anterior tibiæ and tarsi clothed with long rough scales above; posterior tibiæ smooth. Forewings with vein 1b furcate, 2 from near angle, 7 to hindmargin, 10 absent, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{4}{5}$; veins tolerably parallel.

Allied to *Calantica*.

37. *Saridoscelis sphenias*, sp. n.

♀. 12 mm. Head, palpi, antennæ, and thorax white. Forewings elongate, costa moderately arched, apex tolerably acute, hindmargin sinuate, oblique; white, partially finely sprinkled with pale fuscous; a few scattered black scales; two oblique wedge-shaped fuscous spots, anteriorly margined with dark fuscous, on

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inner margin in middle and before anal angle, emitting from apex two partially obsolete and hardly traceable very oblique dark fuscous lines, first apparently sharply angulated near costa, where it forms a short distinct oblique mark at $\frac{2}{3}$, second running to hind-margin beneath apex; a short black interrupted dash before apex: cilia white, with two lines of fuscous or dark fuscous points. Hind-wings and cilia grey.

Hab. Koni; one specimen.

38. *Crobylophora daricella*, Meyr.

Hab. Mone; four specimens.

There is no doubt as to the identity of this minute Australian species, whose occurrence somewhat surprised me.

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II. Further observations on the Tea-bugs (*Helopeltis*) of India. By Charles Owen Waterhouse, F.E.S.

[Read Dec. 6th, 1893.]

In the year 1886, I read before this Society some descriptions and observations on the genus *Helopeltis* (Trans. Ent. Soc. Lond., 1886, p. 457), and in 1888 I supplemented this by the description of another species (Trans. Ent. Soc. Lond., 1888, p. 207). Until quite recently I had only seen a single female example of *Helopeltis theivora*. I am glad to say the British Museum has now received a fair series of this species, with both sexes, and I can therefore give a description of the male.

Helopeltis theivora.

♂. Black. Front of the head very pale yellow on each side. Antennæ black, or nearly so, the basal joint obscure fusco-testaceous mottled with brown, very pale yellow at the extreme base. Femora nearly black, mottled with fuscous-testaceous, with a pale ring at the base. Tibiæ nearly black, mottled with fuscous-testaceous. Scutellar horn about as long as the length of the pronotum, very distinctly curved, with the usual cup-shaped enlargement at the apex. Some examples show a little yellow at the base. Length 2½ lines.

From this description it will be seen that the male differs chiefly from the female in having the pronotum black. The antennæ and legs are also darker, and the whole insect is more slender than the female. The scutellar horn is a trifle shorter and a little less curved than in the female.

Many of the females have the dark brown at the base of the pronotum extending across the whole base.

The following is an extract from the letter from Mr. Frank Austen, who sent the specimens. It is dated from Sylhet, July 1893 :—

"The other day I sent you, per parcel post, a small box, containing a bottle in which are specimens of what, in the tea districts at any rate, is known as mosquito blight. It is to be found in many of the low-lying

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gardens such as this, and from the damage it does is one of the, if not the most, serious pests the tea bush has to contend against. It attacks the young shoots and appears to puncture them so that they shrivel up and turn quite black. As yet there is no known cure. The method we adopt here is to employ a large force of small children, catching the insects by hand. This at best can only check it at the beginning of the season, for when acres and acres of tea are black with it, the thousands of insects brought in every day seem to make no difference. It is first noticeable about the beginning of the rains, *i.e.*, the early part of June, and continues to increase until the end; the bushes attacked by it becoming gradually blacker, until after about the end of August or middle of September, they yield little or no leaf at all. There is apparently no other plant it attacks, even in the jungle, and as far as one can see there is nothing that preys upon it. Wet dull weather is especially favourable to its propagation. It does not appear to fly much, and in the cold weather, after the bushes are pruned, there is not a sign of it. We always burn all the prunings, but it is doubtful whether much good is gained by so doing. It seems to appear spontaneously, first of all a bush here and a bush there, often acres apart, is attacked by it, then it gradually spreads."

Referring to Wood-Mason's suggestion ("Report on the Tea-bug of Assam," 1884, p. 18) that the indigenous tea-plant is not subject to the attacks of *Helopeltis*, Mr. Austen writes, "This is quite a fallacy, as this garden Maguracherra, consisting of some 450 acres, is composed, roughly speaking, of half hybrid and half indigenous, and last year the indigenous flats were badly blighted as well as the hybrid." . . . "There was also another idea that heavy pruning eradicated the *Helopeltis;* but last cold weather we cut back 50 acres of hybrid tea to a standard of 18 inches (the average height of a tea-bush is, say, 3 feet to 3 feet 6 inches), and this year this part of the garden was the first to get blighted, and is by far the most blighted part of the garden; there could have been very few leaf-buds left on the bushes. Also, each bush had its roots carefully forked round, and then the whole place was hoed to a considerable depth."—Letter, Nov. 28th, 1893.

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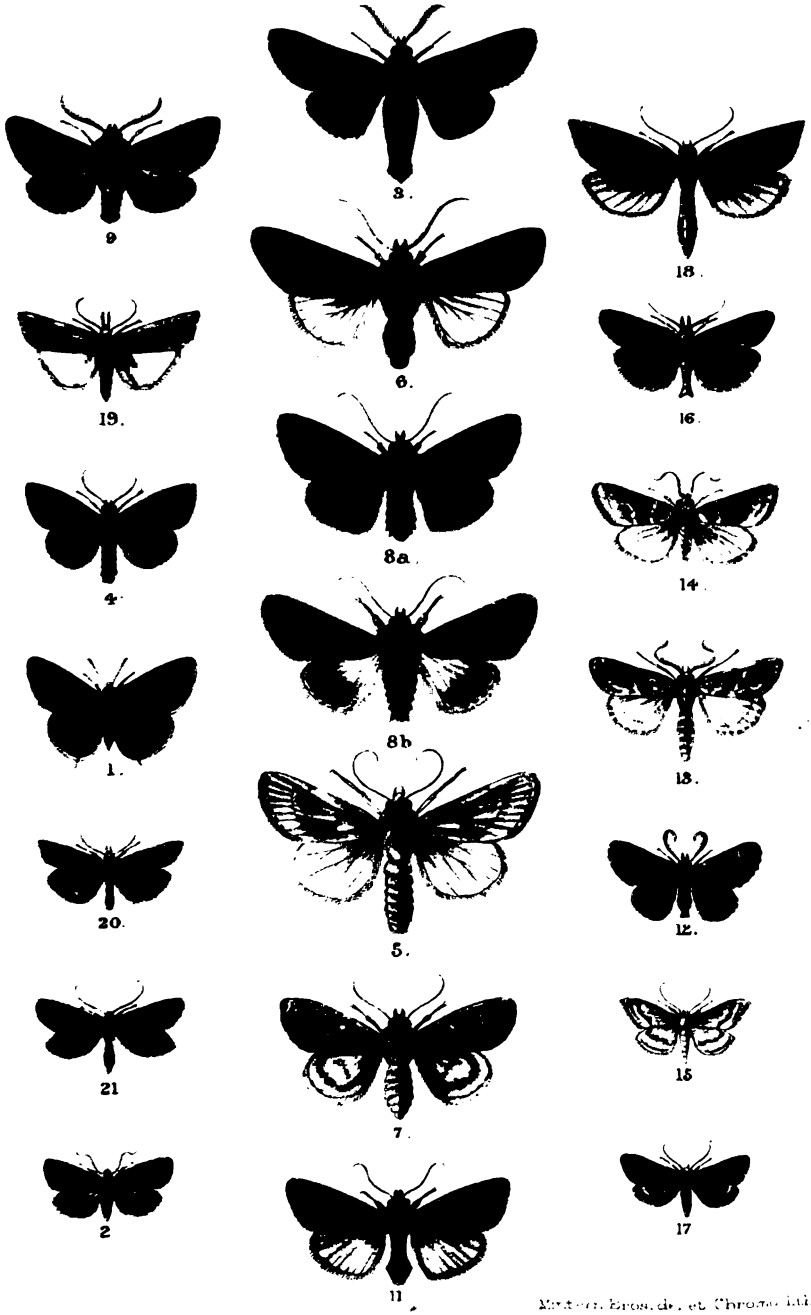

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Lepidoptera from Alexandria.

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III. Notes on some *Lepidoptera* received from the neighbourhood of Alexandria. By George T. Bethune-Baker, F.L.S.

[Read Dec. 6th, 1893.]

Plate I.

Last year I had handed to me a collection of *Lepidoptera* from Alexandria for examination and determination, and during the present summer I had another collection also sent me, so that the two lots will give us some idea of the insects from this neighbourhood, and I therefore make no apology for cataloging the whole collection in detail, following the order of Staudinger's list. The only thing that strikes me as worthy of special note, is the entire absence of any species belonging peculiarly to the Ethiopian region; with such a splendid migratory channel as the river Nile, this is not what I should have expected.

1. *Anthocharis belia*, Cr.

Two small but otherwise quite typical specimens.

2. *Colias edusa*, F., and var. *Helice*, Hb.

The type species not rare, and, as usual, a few of the white variety appear with it.

3. *Deudorix livia*, Klug.

Common. I have some dozen specimens in both sexes.

4. *Thestor ballus*, F.

One specimen quite typical, but small.

5. *Lycæna boetica*, L.

Not uncommon, the blue suffusion of the ♀ is unusually bright in some of the specimens.

6. *Lycæna egyptiaca*, sp. n. (Pl. I., fig. 1.)

♂. Upper side, primaries and secondaries dull violet-blue, very

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slightly lustrous, outer margins very narrowly black. Secondaries with a blackish spot between the first and second median nervules, and another at the anal angle; tail blackish. Underside, primaries and secondaries ochreous-cream colour, with transverse irregular fasciæ margined with white, as follows:—Primaries, two across the cell followed by two across the centre of the wing, reaching almost to the inner margin; between the two submarginal fasciæ is a short one from the costa to the central disco-cellular branch. Secondaries crossed by about eight whitemargined fasciæ; some much broken and transfused. There are two brilliant metallic green spots, pupilled with bluish-black and margined with yellow, at the anal angle. Margins of both primaries and secondaries finely fuscous. Exp. alar. 23 mm.

♀. Brownish, basal and discal area irridescent-blue, the underside pattern showing through by transparency, and being decidedly intensified in the primaries; the black anal spot is composed of two confluent ones, not one only, as in the ♂. The markings of the underside are similar to those of the ♂. Exp. alar. 23-24 mm.

The wings of both sexes are somewhat transparent, but more so in the ♀ than in the ♂.

7. *Lycæna lysimon*, Hb.

Several typical specimens.

8. *Vanessa atalanta*, L.

Two specimens, one with the white dot in the red band.

9. *Vanessa cardui*, L.

One specimen.

10. *Danais chrysippus*, L.

Common. Most of the specimens fine.

11. *Hesperia mathias*, Fab. (*Thrax*, F.)

Three typical specimens.

HETEROCERA.

12. *Acherontia atropos*, L.

One specimen.

13. *Sphinx convolvuli*, L.

The few specimens of this insect are most unusually small.

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14. *Deilephila livornica*, Esp.

Specimens decidedly below the average size.

15. *Deilephila celerio*, L.

Typical, but possibly rather darker than usual.

16. *Deilephila nerii*, L.

Common. The specimens sent are fine and of beautiful colouration.

17. *Earias insulana*, B.

Very common and very variable, ranging from beautiful uniform green to yellow and straw colour.

18. *Nola squalida*, Stgr.

One specimen only.

19. *Cletthara littora*, sp. n. (Pl. I., fig. 2.)

Primaries ochreous-grey, basal third dark brownish-grey bordered externally by a lighter band, which is edged by a perpendicular wavy line of black with an internal edge of whitish; the black line extends from costa straight across to the inner margin; the central area is occupied by a patch of pale reddish-brown, bordering which, on the posterior edge, is a trace of a very interrupted dark line, rising at the centre of the costa and being produced outward round this reddish-brown patch, and then receding to the internal margin; there is a submarginal band of pale reddish-brown shading, edged internally by a toothed interrupted blackish line arising in a small apical black patch. Posterior margin finely blackish. Fringes brownish-grey with darker dividing line. Secondaries grey subhyaline with a dark border. Fringes whitish with darker dividing line. Exp. alar. 17 mm.

There is one specimen, which may be a ♀, but the body is absent, in which the primaries are all dark grey; all the markings of the ♂ are reproduced, with the exception of the reddish-brown central area, but the pattern is very much intensified and darkened, and each of the dark transverse lines are accompanied by a pale border. Exp. alar. 18 mm.

20. *Deiopeia pulchella*, L.

Common.

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21. *Ocnogyna loewii*, L., var. *Clathrata*, Ld.

Not uncommon.

22. *Cossus L-nigrum*, sp. n. (Pl. I., fig. 3.)

Primaries ashen-grey, basal area with scarcely any marks or reticulations; on the submedian vein is a short dark rich brown dash beginning near the centre, and from the end near the anal angle rises a thinner dash up to the lower median branch, forming an L-shaped sign, at the top of which is a small dark brown V; the posterior half of the wings is reticulated and marked in the manner usual to the genus, but to a less extent than ordinary, whilst from a point on the costa about a third from the apex rises a dark brown waved stripe extending across the apical area, but curved, and reaching down to the anal angle; beyond this is another short line just in front of the apex, going across and touching the posterior margin. Costa darkly dotted. Fringes ash-grey. Thorax as primaries. Secondaries dark uniform brownish-grey without markings. Fringes grey. Abdomen paler than secondaries. Exp. alar. 36 to 39 mm.

This species is, perhaps, nearest *Terebra*, though not very near any of the genus that I have seen; it can, however, be immediately separated from *Terebra* by only being about half its size, and by the markless and uniform secondaries.

23. *Psyche* (subgenus *Manatha*) *hampsoni*, sp. n.

Primaries, veins 1*a* and *b* anastomosing; vein 6 present in both wings, but not emitted in primaries from lower angle of cell, as in *Viciella*, Schiff., the type of the subgenus *Megalophanes*; veins 4 and 5 and 8 and 9 stalked. The shape of the wing is contorted and the costa excised. No spine on the fore tibia. Wings are of a uniform luteous grey, head paler, thorax darker than ground colour.

24. *Orgyia dubia*, Tausch., var. *Judaea*, Stgr.

Not uncommon.

25. *Bombyx serrula*, Gn.

Not uncommon.

26. *Bombyx undata*, Klug.

One specimen, which I refer somewhat doubtfully to this species.

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27. *Megasoma repanda,* Gn.

Common.

28. *Megasoma acaciæ,* Klug.

Of this beautiful species described by Klug I have three fine specimens, and also larvæ well preserved.

29. *Bryophila fraudatricula,* Hb., var. *Pallida,* nov. var. (Pl. I., fig. 4.)

Primaries pale greenish-grey, the black transverse lines and black dash in the centre of the median area as in the parent species, but the short dash just above the anal angle is absent. Orbicular and reniform stigmata moderately distinct, outlined in blackish, the latter being filled in with pale grey. Both are much more distinct than in the original form. Secondaries grey, paler than in *Fraudatricula.* Just beyond the centre the wing is crossed by a very distinct blackish line, following the course of the posterior margin, and extending from the costa to the inner margin. In the discal cell there is a dark grey spot.

This is probably a good local form. I have three specimens all smaller than the type form, which agree closely *inter se,* but in one the median black dash is absent. It is evidently closely allied to *Fraudatricula,* so I have thought it better to make it a variety of that insect (from which it can be immediately separated by its very pale colour) rather than make it a new species.

30. *Agrotis pronuba,* L.

Not uncommon and quite typical.

31. *Agrotis puta,* Hb.

Common, the ♀ being unusually dark.

32. *Agrotis desertorum,* B.

One beautifully pale grey specimen.

33. *Agrotis alexandriensis,* sp. n. (Pl. I., fig. 5.)

♂. Primaries yellowish-grey, first transverse line from discal cell to inner margin fawn colour, but rather indefinite, preceding which are three small black spots—one on the costa, one on the median vein, and a third on the submedian, the latter being nearer the base than the preceding ones; there is a dark dot close to the base on the costa and median vein. The second transverse line

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beyond the reniform stigma is also fawn colour, extending from subcostal to submedian vein, but rather broken, the area between the first and second lines is tinged with fawn colour, beyond the second line is a curved row of dark dots from subcostal to submedian vein. Orbicular stigma almost obsolete. Reniform stigma outlined in fawn colour, with a similar coloured crescentic continuation below the extremity of the discal cell; directly above this stigma the costa is darkly dotted. Posterior margin darkly dotted; fringes yellowish-grey with paler extremities. Secondaries silvery grey. Fringes entirely snow-white. Exp. alar. 42 mm.

♀. Primaries uniform brownish-grey, slightly lustrous, no marking at all visible except a small darker spot representing the orbicular stigma; the reniform stigma is finely outlined and pupilled with darker grey. Posterior margin darkly dotted. Fringes whitish with dark extremities. Secondaries silvery-grey, brownish towards outer margin, slightly lustrous. Fringes silvery-grey. Exp. alar. 40 mm.

I have also one specimen, probably the same species, of an uniform pale ochreous-fawn colour, the first and second line as in type, but the former extended up to the costa and rather broken, the latter being followed immediately by a curved row of very fine dark minute dots, from which to the posterior margin the ground colour is rather darker, interrupted only by a doubly curved paler transverse line from the costa to the anal angle.

This species will follow *Desertorum*, B.

34. *Agrotis nili*, sp. n. (Pl. I., fig. 6.)

♂. Primaries grey, the first line close to the base, rising in a black costal dot, is only just traceable; the second line, pale and waved, rises from a black costal spot, extends to the inner margin, though somewhat indistinct there, and is bordered externally by a fine blackish edge; in the median area is a small narrow oval blackish loop adjoining the second line, and filled in with pale ochreous. Third line very dark grey, curved outwardly, rising in a black costal spot and reaching to the inner margin; this line consists of a series of minute distinct crescentic marks joined at the tips, and is edged by a fine line of slightly paler ground colour. Posterior margin finely edged with black, and preceded by a band of dark grey shading; just in front of the apex there is also a patch of this dark grey shading. Orbicular stigma slightly ochreous-grey, very finely encircled, and minutely pupilled with blackish; reniform stigma

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dark grey edged with black. Between these two stigmata is a trace of an indefinite perpendicular band of dark grey shading right across the wing. Fringes grey with a dark dividing line. Thorax grey, abdomen paler grey. Secondaries and fringes white. Exp. alar. 38—39 mm.

♀. Primaries pale greyish-cinnamon-brown, first line close to base indistinct reddish-brown, second line waved reddish-brown, third line very indistinct, followed by a curved row of white dots, from whence the ground colour of the wing becomes abruptly darker up to the hindmargin, which is finely edged by a light line, and preceding which is a series of dark grey shadings between each nervule. Orbicular stigma distinctly encircled with reddish-brown, as is the reniform, the latter being filled in with greyish. Between these two stigmata there is a perpendicular band of dark reddish-brown shading right across the centre of the wing, and a similar coloured patch is in front of the apex. Fringes brownish-grey. Secondaries brownish-grey, darker near the hindmargin. Fringes pale grey. Thorax as primaries, abdomen as secondaries. Exp. alar. 35 mm.

35. *Agrotis suffusa*, Hb.

Not uncommon and quite typical.

36. *Mamestra afra*, sp. n. (Pl. I., fig. 7.)

Primaries pale ochreous-grey, the first line close to the base is black, toothed, extending from the costa to the submedian vein, and is followed by a whitish stripe; second line in front of the orbicular stigma is composed of three crescentic dark marks starting from a dark grey costal spot, the central and inner crescents being preceded by a whitish edging. Orbicular stigma white, beneath which is a small dark crescent touching the middle of the second line and so making the letter C below the stigma. Reniform stigma margined with black, except on the costal side, with a basal inner margin of white and filled in with dark grey, except at the apical corner, where the colour is ochreous-grey. Subterminal line, consisting of a very strongly serrated fine dark line, bordered externally by white, is curved out beyond the reniform stigma, but terminates on the inner margin nearer the base than is that stigma. The terminal line close to posterior margin, strongly serrated, is white, edged internally by a dark shading, and with a dark patch opposite the reniform stigma. The hindmargin is conspicuously edged with dark crescentic marks between each vein. Fringes grey tessellated with white, and having a dark dividing line; on the costa are seven

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dark grey spots, four near the base and three between the two stigmata.

Secondaries white, cell marked by a dark median vein and closed by a distinct dark crescent; there is a broad dark grey band from the apex to the inner angle. Posterior margin edged by a fine dark line, which is preceded by a broad whitish band. Fringes white. Antennæ finely serrated. Exp. alar. 33 mm.

This species is allied to *Stigmosa*, Chr., but can be at once distinguished by the white secondaries with the crescentic termination of the cell. The primaries are much greyer in colour, the transverse lines more pronounced, whilst there is no trace of the triangular spot in front of the apex.

37. *Mamestra abbas*, sp. n. (Pl. I., fig. 8, a ♂, b ♀.)

♂. Primaries uniform brownish-grey, first two transverse lines slightly paler, and finely margined on each side with dark brown, the third pale line darkly margined internally only; subterminal line fine, indistinct and interrupted, with three dark arrow-shaped marks emitted towards the base. Hindmargin darkly dotted. Orbicular stigma pale ochreous-grey, pupilled with the ground colour, and partly encircled with dark brown, beneath this is a distinct darkly outlined C-shaped sign. Reniform stigma pale brownish-grey outlined with dark brown and pupilled with paler grey, which pupil is margined with dark grey. Fringes brownish-grey with a paler dividing line. Secondaries brownish-grey, darker around the posterior margin. Fringes pale grey. Exp. alar. 35 mm.

♀. Primaries, ground-colour very pale ochreous-grey, pattern as in ♂. Secondaries very pale ochreous with a broad dark posterior margin. Exp. alar. 38 to 40 mm.

This species will come next to *Trifolii*; it is easily recognized by its quite uniform and duller colouration and markings, by its much darker secondaries, and by its exceedingly pale ♀.

38. *Heliophobus marsdeni*, sp. n. (Pl. I., fig. 9.)

♂. Primaries brownish-ochreous, basal area much paler, the first transverse line in front of the orbicular stigma is dark brown, interrupted and edged internally with pale ochreous; beyond the reniform stigma is a pale ochreous transverse dentated and interrupted line edged internally with dark brown; area between these lines darker than rest of wing: subterminal line pale ochreous,

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interrupted and edged internally with dark brown; posterior margin darkly dotted, orbicular stigma distinct, pale ochre, finely outlined with dark brown. Reniform stigma indistinct, grey, with a pale dash on the basal edge; costa with three pale ochreous spots. Fringes lustrous ochreous-brown. Abdomen greyish white. Secondaries very pale grey, slightly darker on posterior margin. Exp. alar. 30 to 32 mm. Antennæ very strongly ciliate, almost plumose.

♀. Similar to ♂, but the colours each intensified, *i.e.*, the dark areas are darker, the light are lighter; all the markings much more pronounced, and the reniform stigma distinct. Antennæ simple. Exp. alar. 28 mm.

The ♂ differs somewhat in colouration, some being quite pale ochreous with dark central areas, others dark greyish ochre, and much more uniform in general tone; the pattern is however apparently quite constant. The primaries of ♀ are decidedly narrower than the ♂.

This species will follow *Orana* of Lucas, but is easily recognizable by its more variegated appearance, visible in even the greyest and most uniform specimens; also by the basal line, the pale line beyond the reniform stigma, and the dark reniform itself. There is no pale patch at the apex as in *Orana*.

The secondaries are very much paler, and the abdomen is whitish-grey instead of brown as in Lucas's species. I have named this insect after Mr. Marsden of Alexandria, through whose kindness I have received these collections.

39. *Miana trilinea*, sp. n. (Pl. I., fig. 10.)

Primaries ashen-grey, first line near base dark brown, strongly dentate on median vein; second dark brown line touching orbicular stigma internally; third line just beyond the reniform, likewise dark brown; the area between the first and second lines is much paler grey. Just beyond the third line is a band of paler shading; orbicular and reniform stigmata pale grey darkly outlined. Posterior margin finely edged with dark brown. Fringes lustrous grey. Secondaries pale grey, slightly lustrous, darker near posterior margin. Fringes paler grey. Thorax as primaries. Abdomen as secondaries. Exp. alar. 21½ to 23½ mm.

40. *Eriopus latreillii*, Dup.

A common insect of the ordinary type.

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41. *Prodenia littoralis*, B.

Several specimens quite typical.

42. *Sesamia cretica*, Ld.

Two nice specimens.

43. *Caradrina exigua*, Hb.

Not uncommon.

44. *Caradrina mediterraneæ*, sp. n. (Pl. I., fig. 11.)

Primaries ashen-fawn colour with the least trace of a greyish subterminal transverse curved line. Just in front of the posterior margin is an indistinct row of very pale ochreous-white spots, the middle spots having their inner margin dusted with golden-brown. Orbicular stigma obsolete, reniform stigma small dark brown encircled with pale ochreous. Costa with four indistinct black spots. Fringes lustrous greyish-fawn colour. Secondaries white, lustrous, very slightly greyish near posterior margin. Fringes lustrous greyish. Exp. alar. ♂ 30 mm.; ♀ 25 mm.

This species is perhaps nearest *Quadripunctata*, but at once separable by the almost entire absence of markings and by its much paler and cleaner appearance. From *Flava* of Fallou it is recognizable by the same characteristics.

45. *Cucullia chamomillæ*, Schiff.

I have four specimens of this genus, which are doubtful, but appear to be a very dwarfed race of this species, and I therefore place them provisionally under this name.

46. *Plusia chalcites*, Esp.

Two ordinary specimens.

47. *Plusia gamma*, L.

Not uncommon.

48. *Heliothis peltigera*, Schiff.

Not rare.

49. *Heliothis nubigera*, H. S.

One specimen only.

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50. *Heliothis armigera*, Z.

One specimen only.

51. *Erastria scitula*, Rbr.

One specimen.

52. *Thalpochares phoenissa*, Ld.

Two typical specimens.

53. *Thalpochares ostrina*, Hb.

Similar to European specimens.

54. *Thalpochares parva*, Hb.

Two specimens quite typical.

55. *Cerocala scapulosa*, Hb., var. *Insana*, H. S.

One specimen.

56. *Pericyma albidentaria*, Frr.

I have two specimens of this insect, which form a sort of "transit" to the var. *Squalens*, Ld.

57. *Leucanitis stolida*.

One specimen of the usual form.

58. *Grammodes bifasciata*, Petag.

Not uncommon.

59. *Pseudophia illunaris*, Hb.

A common insect.

60. *Pseudophia benenotata*, Warren.

A common species. In the National collection is the hitherto unique type which Warren described. It is a ♂, and as I have several ♀ before me it may be advisable to describe this sex.

♀. Primaries pale ochreous-grey, with perhaps the least trace of pink; both first and second transverse lines paler than ground colour, not darker as in the ♂; the subterminal pale line is much more distinct, and the shading on each side of it is paler than in the opposite sex. Secondaries slightly ochreous-grey with broad dark borders and very pale fringes. Thorax and abdomen as primaries. Exp. alar. 26 to 30 mm.

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Specimens vary somewhat in depth of colour, some being paler and others rather darker than the type.

61. *Spintherops exsiccata*, Ld.

Several specimens, calling for no remark.

62. *Hypena ravalis*, H. S.

Not uncommon.

63. *Hypena lividalis*, Hb.

Three ordinary specimens.

64. *Hypena obsitalis*, Hb.

A common insect.

65. *Arrarde parva*, sp. n.

Primaries pale ochreous-brown, basal half decidedly darker than exterior half; the subterminal waved line is paler and bordered internally by a fine line of darker ochreous, and externally by a broadish band of the same coloured shading. Apex with a small patch of blackish scales, a few similar coloured scales being scattered near the anal angle. Costa near apex lightly spotted. Fringes ochreous-brown. Secondaries brownish-grey, darker near the outer margin, with pale grey fringes. Thorax as primaries. Abdomen rather darker than secondaries. Exp. alar. 14 mm.

I have but one specimen of this insect, but it so evidently a distinct species that I do not hesitate to describe it, though from a single specimen.

66. *Nemoria faustinata*, Mill.

Two specimens of usual form.

67. *Acidalia coenosaria*, Ld.

One specimen.

I have two other species of this genus, which I believe to be new, but I do not think it wise to describe them from single specimens, and I shall therefore await other specimens before naming them.

68. *Macaria aestimaria*, Hb., var. *Sareptanaria*, Stgr.

Two very handsome forms of this variety.

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69. *Fidonia megiaria*, Obr., var. *Obscuraria*, n. var. (Pl. I., fig. 12.)

The specimens obtained around Alexandria are very dark indeed, and appear to be quite a local race; it is a common insect in the district. The ground colour is uniform dark greyish brown, the pattern being quite similar to that of Oberthur's species, but very considerably darker. Out of all the specimens before me the lightest is very much darker in every respect than the darkest Algerian form that I have seen. The Egyptian specimens are a very handsome variety of it.

70. *Sterrha sacraria*, L., and var. *Sanguinaria*, Esp., and ab. *Oranaria*, Lucas.

I have this species of all shades from Alexandria, from the palest forms up to var. *Sanguinaria*, also I have the duller and darker insect described by Lucas under the name *Oranaria*.

I have no doubt whatever that Staudinger is right in his 1872 catalogue, where he says, on page 176, "an sequ. ab." *Sacraria* being the following species.

I have preserved larvæ of both forms before me which are quite similar, and I have also two very rich dark forms infinitely darker than *Oranaria*, the oblique stripe being very dark ash-grey, thus showing that the species varies very extensively indeed.

71. *Cidaria fluviata*, Hb.

Not uncommon.

72. *Eupithecia ultimaria*, B.

Two specimens, decidedly smaller than usual.

73. *Eupithecia distinctaria*, H.S.

Two pretty forms of this wide-spread species.

74. *Eupithecia* (*Gymnocelis*) *pumilata*, Hb.

Two or three ordinary specimens.

75. *Mnesixena quadripunctata*, sp. n. (Pl. I., fig. 13.)

Primaries brownish-grey, with a transverse pale line near the base from the costa to the inner margin, the line being composed of three small crescents; the submarginal pale line, frequently and sharply serrated, recedes slightly from the apex to the subcostal

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vein, where it curves outwards, receding again to the submedian vein, whence it recedes rapidly and considerably to the inner margin, and has a very fine dark edging. In the central area of the wing are four distinct whitish spots, around each of which are sprinkled, in fresh specimens, some dark brown rough scales. Hindmargin finely and darkly edged. Fringes pale grey. Secondaries whitish, with a fine submarginal dark grey stripe a little distance from the hindmargin, but following its course. Hindmargin finely and darkly edged. Fringes whitish. Antennæ ♂ ciliate; ♀ simple. Exp. alar. 23 mm.

76. *Mnesixena bella*, sp. n. (Pl. I., fig. 14.)

Primaries pale-grey, irrorated with pale chestnut roughish scales; basal area dark chestnut-brown with a patch of superimposed rosy scales; in the central area beyond the middle, near the inner margin, is another patch of rosy scales, having a dark chestnut basal border, which is edged by a white line, the inner margin beneath this patch being chestnut colour. Posterior margin broadly but sparingly irrorated with rosy scales, which also extend along the inner margin from the anal angle to the rosy patch just mentioned. From the costa near the apex, a fine indistinct transverse white line extends half across the wing, forming the internal border to the posterior rosy scales. Fringes greyish, irrorated with pink. Antennæ ♂ ciliate. Secondaries whitish, with whitish fringes. Exp. alar. 19 to 23 mm.

In specimens that have flown much the rosy scales get almost entirely rubbed off.

77. *Hypotia syrtalis*, Rag.

The specimens are typical.

78. *Hypotia bilinea*, sp. n. (Pl. I., fig. 15.)

Primaries greyish-straw colour, central area bounded internally by an oblique dark brownish transverse line, and externally by a similar dark curved transverse line. In this area, beyond the centre, and near the costa, is a dark brownish-grey spot. Just before the posterior margin is a fine dark line, which in flown specimens is very indistinct. Secondaries very slightly paler than primaries, with a dark brownish-grey curved stripe beyond the centre, extending from the upper margin to the anal angle, and another similar stripe just in front of the posterior margin. Fringes ochreous-grey. Thorax as primaries, abdomen as secondaries. Exp. alar. 16–18 mm.

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79. *Talis afra*, sp. n. (Pl. I., fig. 16.)

Primaries dark ashen-grey irrorated more or less with blackish scales. Across the centre of the wing is a transverse whitish stripe, the upper half of which is waved, the lower half being straight and edged externally with very dark brown. The second whitish transverse line near the posterior margin is very irregularly toothed and waved. Submarginal area with a broadish band of whitish shading. Between these two lines in the central area on the internal margin and near the costa is a very distinct white spot darkly encircled. Posterior margin very distinctly dotted with black. Fringes shining brownish-grey. Secondaries dark brownish-grey with white fringes, which have a very dark and broad dividing line. Exp. alar. 23½ mm.

I have two specimens, one being paler than the type.

80. *Hellula undalis*, F.

Common and quite typical.

81. *Odontia dentalis*, Schiff.

Two small specimens.

82. *Anthophilodes baphialis*, Ld.

Fairly common.

83. *Botys ferrugalis*, Hb.

Several specimens.

84. *Eurychreon nudalis*, Hb.

Two specimens, just like those from Algeria.

85. *Orobena isatidalis*, Dup.

A common species.

86. *Margarodes unionalis*, Hb.

Two specimens.

87. *Metasia emiralis*, Obr.

Several specimens, which are somewhat yellower and the dark marks darker than the Algerian form.

88. *Synclera traducalis*, L.

Two specimens.

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89. *Duponchelia fovealis*, L.

One or two ordinary specimens.

90. *Nymphula fusco-marginata*, sp. n. (Pl. I., fig. 17.)

Primaries greyish-brown, with a short interrupted dark dash from the roots just beneath the discal cell; beyond the centre is a smallish dark brown circular sign, the circle being incomplete on the posterior side, beneath which is a trace of a cinnamon-brown transverse dash extending to the inner margin. Submarginal line white, edged externally with black, from where up to the posterior margin is a band of pale cinnamon-brown. Fringes greyish lustrous, with a dark dividing line. Secondaries whitish, with a large black spot on the upper part of the discal cell, whence to the inner margin runs a waved black stripe; beyond this is a dark grey stripe, followed by a line of the ground colour, after which is a broad band of very dark grey, extending from the costa to the inner margin just over the anal angle; this is followed by a broadish stripe of the whitish ground colour edged externally by a fine dark line, the posterior margin itself being broadly bordered with pale cinnamon-brown, margin itself very finely black. Fringes whitish, with a fine black dividing line. Thorax as primaries, abdomen brownish. Exp. alar. 16 mm.

91. *Schoenobius dodatellus*, Walker.

One specimen.

92. *Chilo dubia*, sp. n. (Pl. I., fig. 18.)

Primaries pale brownish-ochreous; all along the median area are very sparsely scattered a few dark-brown scales, which also are extended in lines between all the nervules on the hind margin. Secondaries whitish, somewhat lustrous, with white fringes. 3 ♂ specimens. Exp. alar. 28—32 mm.

In some specimens there is an indistinct darkish spot closing the discal cell.

93. *Ancylolomia palpella*, Schiff.

Not uncommon.

94. *Crambus alexandriensis*, sp. n. (Pl. I., fig. 19.)

♂. Primaries pale-grey irrorated all over with greyish-brown scales, interspersed with patches of black irrorations; about one third from the base is a whitish < shaped mark between the discal

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cell and the inner margin. The subterminal white transverse line is very sharply angulated outwards near the apex, whence it recedes in a wavy curved line to the inner margin; the central area is occupied by a patch of black scales edged externally with white, over which on the costa is another small blackish patch also, and in the cell is a small blackish dash over the < shaped white mark. The hind marginal area is dark grey, the posterior margin itself being edged with a fine metallic-greenish line. Fringes whitish, brown at extremities, and having a brown dividing line. Secondaries greyish-white, slightly lustrous, with white fringes. Thorax greyish, abdomen paler grey. Exp. alar. 24 mm.

The ♀ is darker with less marking, much less black scaling, and having the > shaped mark and the subterminal line only just traced out. Exp. alar. 22 mm.

This species is not very near any Palearctic *Crambus*, and though I am acquainted with nearly all the species from our region, I cannot now place it in its correct position. Perhaps when I get more specimens (I have only one pair before me), I may be able to settle this point.

95. *Crambus afra*, sp. n. (Pl. I., fig. 20.)

Primaries pale fawn colour, the first very oblique and sharply dentate rich brown line rises beyond the centre of the costa and recedes sharply to a point about one third from the base on the inner margin, the subterminal line is the same rich reddish-brown colour, is sharply angulated outwards near the costa, and is broadly edged externally by the pale ground colour, the rest of the marginal area being dark mauvish-grey; from the roots to the first line the whole of the median area is of a rich dark brown, broadly edged all round by the pale ground colour. Posterior margin darkly dotted. Fringes brownish-grey tesselated with fawn colour. Secondaries brownish-grey with whitish fringes, which have a fine dark dividing line. Thorax brown, patagiæ fawn colour. Abdomen greyish. Exp. alar. 19 mm.

This pretty species is nearest to *Jucundellus*, H. S., but is decidedly smaller, and can also be distinguished by the very dark and serrated lines, which are quite different in shape to those found in that species.

96. *Eromene ramburiella*, Dup.

One poor specimen.

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97. *Eromene ocellea*, Hw.

Not uncommon apparently, one or two specimens having been in each of the two collections received.

98. *Myelois rhodochrella*, H.S., and var. *Hellenica*, Stgr.

One specimen of the type, and also one of its beautiful variety.

99. *Ematheudes punctella*, Tr.

One or two nice specimens.

100. *Melissoblaptes bipunctanus*, Z.

These specimens are fine, but call for no special remark.

101. *Crocidosema plebejana*, Z.

One specimen.

102. *Hapsifera luridella*, Z.

Several specimens.

103. *Scardia mediterraneæ*, sp. n. (Pl. I., fig. 21.)

Primaries slaty grey, a broadish longitudinal pale ochreous stripe extends from the base along the median area just beneath the cell, over which patches of dark brown rough scales are more or less scattered. Beyond the centre and near the costa is a short dash of the same pale ochreous, in the middle of which is a distinct spot of these dark brown superimposed scales. Costa palely spotted near the apex. Posterior margin darkly edged. Fringes dark grey. Secondaries brownish-grey, paler at the base. Fringes brownish-grey, tibiæ dark grey frequently encircled with pale ochreous. Hindlegs whitish. Exp. alar. 19 to 20 mm.

Specimens vary slightly *inter se*, some having the costa palely spotted all along, and having a few pale spots in the subcostal area, which gives such specimens a more variegated appearance.

104. *Tinea tapetzella*, L.

Two specimens.

105. *Agdistis tamaricis*, Z.

Two or three ordinary specimens.

106. *Alucita monodactyla*, L.

Two specimens.

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Explanation of Plate I.

No. 1. *Lycæna egyptiaca*, sp. n.
2. *Clethara littora*, sp. n.
3. *Cossus L-nigrum*, sp. n.
4. *Bryophila fraudatricula*, Hb., var. *Pallida*, nov. var.
5. *Agrotis alexandriensis*, sp. n.
6. *Agrotis nili*, sp. n.
7. *Mamestra afra*, sp. n.
8. ♂ a & ♀ b *Mamestra abbas*, sp. n.
9. *Heliophobus marsdeni*, sp. n.
10. *Miana trilinea*, sp. n.
11. *Caradrina mediterraneæ*, sp. n.
12. *Fidonia megiaria*, Obr., var. *Obscuraria*, nov. var.
13. *Mnesixena quadripunctata*, sp. n.
14. *Mnesixena bella*, sp. n.
15. *Hypotia bilinea*, sp. n.
16. *Talis afra*, sp. n.
17. *Nymphula fusco-marginata*, sp. n.
18. *Chilo dubia*, sp. n.
19. *Crambus alexandriensis*, sp. n.
20. *Crambus afra*, sp. n.
21. *Scardia mediterraneæ*, sp. n.

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IV. *The Rhynchophorous Coleoptera of Japan.* Part III. Scolytidæ. By Walter F. H. Blandford, M.A., F.Z.S.

[Read Dec. 6th, 1893.]

The Rhynchophora collected by Mr. George Lewis in the Japanese Archipelago during the years 1880 and 1881 have been described in part by Dr. Sharp in the 'Transactions' of this Society for 1889 and 1891. In this paper I deal with the *Scolytidæ* of that collection, four species of which I have already described in my paper on the *Scolyto-platypini*.

To the present time our knowledge of Japanese Scolytids rests upon the materials brought together by Mr. Lewis up to 1872, before which date but one species, *Genyocerus adustipennis*, Motsch., was known as Japanese. Nothing resembling that insect exists in this collection, and I have nothing to say about it. The species of the earlier collection were submitted, the *Tomicini* to Eichhoff, the remainder to Chapuis, and the results are given in the 'Annales de la Société entomologique de Belgique,' 1874, pp. 195—203, in a paper entitled "Scolytides recueillis au Japon par M. G. Lewis." They distinguished 18 species, of which one occurred also in Europe; the rest were new. In 1878 Eichhoff in his "Ratio Tomicinorum" added six species (one European), and fully described those he had previously diagnosed.

Nothing else has been written on the subject, and I have not found it necessary to redescribe the species of Chapuis and Eichhoff, and have merely indicated localities, etc., and some points of distinction between them and new species. The original descriptions, and in the case of *Tomicini* the later ones of Eichhoff, are sufficient to identify them by.

The number of species known to exist in Japan before my examination of this collection was 25; I raise it to 104 by the addition of 79 species, of which 71 are new.

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Provided that I have correctly identified all the five new species described by Eichhoff in 1878, this collection contains all known Japanese species except *Hylastes attenuatus*, *Xyleborus badius*, and *Genyocerus adusti-pennis*, and all types peculiar to Japan except of that insect and the five referred to.

The number of species, 104,* is perhaps a little above the mark, because I have been obliged to describe under separate names three male *Xylebori* which cannot be referred to their respective females. In a few cases I may have subdivided a species into two, but it is likely that these are counterbalanced by others where I have included distinct species as varieties. Students of the European forms know that species closely resembling each other in appearance may differ in habits, food-plants, and the form of their galleries. In dealing with an exotic collection one has to do without the assistance of such facts.

They are divided into 25 genera, of which three are new, *Hyorrhynchus*, *Sphærotrypes* and *Acanthotomicus*. The two first are quite distinct; *Sphærotrypes* is also found in India. *Acanthotomicus* is a separation from *Tomicus*, Latr. (1807). I have restored *Taphrorychus apatoides*, Eichh., to *Dryocœtes*, and do not include any Japanese species in the former genus.

So complete a collection testifies both to the ability of Mr. Lewis as a collector and to the richness of Japan in this family, for, though it is probably surpassed in this respect by many tropical countries, its 104 species compare very favourably with the 130 or so described from Europe and the rather larger number from North America. There must be many others to discover. Not a few species are unique, others have occurred here and there as single specimens, and 7 out of the 18 first described have not reappeared. The total number existing in the islands may be expected to exceed 150.

The best represented genera are *Hylesinus* (6 species), *Phlœosinus* (7 species), *Scolytus* (6 species), *Dryocœtes* (8 species), and *Xyleborus* (29 species exclusive of males).

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* The number varies from that given in the 'Proc. Ent. Soc.,' 1893, p. xxxix, as I have received, since then, additional specimens from Mr. Lewis's unmounted Coleoptera, and a small number from Colonel von Schönfeldt.

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Cryphalus and *Pityophthorus* with one species each, and *Tomicus* with two, are poorly represented, and are likely to be augmented by future collectors. The *Platypini* consist of nine species in three genera.

In origin the Japanese *Scolytidæ* are partly Palæarctic and partly Oriental. From the former region come *Hylastes attenuatus* and *glabratus*, *Myelophilus piniperda* and *minor*, *Crypturgus pusillus*, *Tomicus cembræ*, *Dryocœtes autographus*, and *Trypodendron quercus*; *Xyleborus adumbratus*, m., and *sobrinus*, Eichh., are little more than varieties of *X. pfeili* and *saxeseni* respectively. Little is known of N. Asiatic *Scolytidæ* and further identifications cannot be made. The only Oriental species I have recognised are *X. obliquecauda*, Motsch., which occurs in Ceylon, and *X. badius*, Eichh.; but in many other *Xylebori*, and in the genera *Sphærotrypes*, *Cosmoderes*, *Crossotarsus*, and *Diapus*, we have characteristically Oriental forms. There are no American species among them, though in one or two genera, as *Scolytus*, I have not sufficient material from America to institute a comparison; and none of the few Hawaiian species described by Dr. Sharp are to be found.

Though our knowledge of Asiatic *Scolytidæ* is so imperfect as to render such conjectures hazardous, I am inclined to think that Oriental forms predominate. There is no tendency of the Palæarctic species to be confined to the northern islands of the Archipelago.

In describing these small insects it is important to obtain all measurements exactly, whether of the total length or of the relative dimensions. Estimation with the eye of the comparative width and length of a prothorax leads to error, as do rough measurements of length.

Chapuis gives the length of *Phlœosinus perlatus* as 2 mm., whereas the type measures 3 mm., that is, 50 per cent. longer. Such an error in the measurement of a species an inch long would be gross, and it is hardly less so when made about a small insect. Except in a few genera, as *Scolytus*, the range of size does not exceed one fourth of the average length, and may be much smaller.

I have taken all measurements with a micrometer eyepiece, and a mechanical microscope stage fitted with a scale reading to 1-10th mm. This method is quite exact, and speedy in practice.

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A large proportion of the type-specimens, both of genera and species in this family, are in Chapuis' collection in the Brussels Museum, which I have visited for the purpose of examining them. I desire here to warmly acknowledge the hospitable reception I have met with from M. G. Severin, Curator of the Articulata, and the admirable facilities he has afforded me for the study of that collection.

SCOLYTINI.

Hylastes, Er.

I have added three species to those described by Chapuis and changed one of his names.

Table of Species:

1. Third tarsal joint not wider than the preceding joints; mesosternum not prominent in front (*Hylastes*, s. str.) 2
   wider than preceding joints; mesosternum prominent (*Hylurgops*, Lec.) . 5
2. Rostrum carinate . . . . . *parallelus*, Ch. 4
   not carinate 3
3. Thorax not transverse, uniformly narrowed to apex . . . 4
   transverse, constricted at apex. . . . . *ambiguus*.
4. Interstices with a single row of bristles from base to apex. *attenuatus*, Er.
   with an irregular double row from base to middle, thence single . . *plumbeus*.
5. Punctures of thorax of two sizes . . . . . *interstitialis*, Ch.
   uniform . . . . . *glabratus*, Zett.

Hylastes parallelus, Chap.

Chap., Scol. Jap., p. 196.

Common; Yokohama, Bukenji, Kiushiu (Higo, &c.)

Hylastes attenuatus, Er.

One example, Hiogo (*von Schönfeldt*).

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Hylastes plumbeus, n. n.

H. obscurus, Chap., Scol. Jap., p. 197.

Common; taken with *H. parallelus*, also at Nikko, Kobe, &c.

Somewhat variable, in colour from black to obscure brown, in the width of the rostrum and prothorax, and in the depth of the elytral striæ. I have changed the name, owing to the priority of *Hylastes* (*Hylastinus*) *obscurus*, Marsh. (*trifolii*, Müll.)

Hylastes ambiguus, sp. n.

Oblongus, subnitidus, piceo-brunneus, capite granulato, fronte haud carinata, punctata; prothorace transverso, antice constricto, fortiter punctato, linea media elevata lævi; elytris basi singulis subtiliter rotundatis, prothorace latioribus et duplo longioribus, striato-punctatis, striis aequaliter impressis, interstitiis rugosis versus apicem tuberculatis, squamulis brevibus vestitis et uniseriatim setosis; tarsorum articulo 3o antecedentibus haud latiore. Long. 2·7 mm.

Fujisan, one specimen, in bad condition, apparently dead when taken.

Suggesting in appearance the species of the sub-genus *Hylurgops*, Lec., but without the prominent mesosternum and evidently bilobed 3rd tarsal joint. Reddish-brown, somewhat shining. Head black, finely granulate on vertex with a shining central line, rostrum wide, not carinate, front strongly punctured; antennal club with first joint large, equal to the two succeeding joints. Prothorax transverse, constricted towards apex above and at sides, strongly and closely punctured, inconspicuously pubescent, with a fine central raised line from base to anterior constriction. Elytra wider than prothorax at base, and exactly twice as long, basal angles prominent rounded, sides slightly rounded to near apex, thence somewhat oblique and feebly sinuate, apex rather obtuse in middle; above brown, lighter behind, striato-punctate, striæ not deep, their punctures strong, interstices rugose at base, with a single row of fine tubercles from middle to apex, covered with short scale-like hairs and a single series of scattered setæ. Underside brown, punctured; middle coxæ rather widely separated.

Very like *H. opacus*, Er., but quite distinct in the shape of the thorax.

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Hylastes interstitialis, Chap.

Chap., Scol. Jap., p. 196.

A few more examples taken at Subashiri, Kiga, and Nagasaki.

Hylastes glabratus, Zett.

Nikko; two specimens.

This European species is very similar to *H. interstitialis*, but the finer uniform punctuation of the prothorax is quite different from the much coarser and variolose punctuation of *interstitialis*, in which the coarse punctures are mixed with finer ones. *H. piniſex*, Fitch, which I consider distinct from *H. glabratus*, has the thoracic punctures of two sizes, but not variolose or confluent.

MYELOPHILUS, Eichh.

Hylurgus, Latr. . . . *Blastophagus*, Eichh.

Both the European species are found in Japan.

Myelophilus piniperda, Fabr.

Already recorded by Chapuis (Scol. Jap., p. 197).

Taken at Nagasaki and Oyayama, both in Kiushiu. Some specimens measure as much as 5·4 mm.

Myelophilus minor, Hart.

This species has been hitherto inserted in the Japanese list by error; Chapuis mentioned it (Scol. Jap., p. 198) as a species likely to occur, and stated that it was brought from China by Mr. Lewis, who has since then taken one specimen near Nagasaki.

HYORRHYNCHUS, nov. gen.

Caput rostratum, rostello lateraliter marginato. Oculi bipartiti. Antennæ sub carina rostrali inter partes oculorum inferiores et mandibulas insertæ, scapo recto, funiculo 7-articulato, articulo 1o magno, 2o obconico, ceteris transversis latitudine crescentibus, clava magna oblonga subcompressa, 3-articulata,

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suturis rectis notata, pilosa. Prothorax subdepressus, lateribus determinatis, non tamen marginatis, basi immarginata. Elytra ad basim singulatim convexa, theracem superantia. Coxæ anticæ magnæ globosæ, a processu prosterni angusto separatæ. Pedes longi, tibiis subcompressis, leviter dilatatis, ad apicem oblique truncatis, margine exteriore inermi. Tarsi articulo 1o brevi, 2o paullo longiore incrassato, 3o brevi, subtus producto et profunde emarginato, 4o minimo, 5o magno ceteris conjunctim aequali.

Head shortly rostrate, the sides of the rostrum carinate, differing according to sex in the single species. Eyes divided, their segments distant, placed above and below the base of the rostrum. Antennæ inserted below the rostral carina between the lower half of the eye and the base of the mandible, short, the club nearly equal in length to scape and funiculus together. Maxillæ with outer border rounded, inner edge convex and narrowly produced at tip, set with straight flat spines. Submentum produced into an angle at either side and broadly emarginate between, with a second emargination in middle at base of mentum, which is nearly twice as long as broad, narrow at base and becoming dilated to middle with sides, thence parallel ; labial palpi long, with joint 1 as long as broad, 2 transverse, 3 longer than broad. Prothorax flattened above, its sides strongly inflexed to anterior coxæ, forming an angle with pronotum which is not sharp or margined. Anterior coxæ not situated near front border of prosternum, very large, prominent and globose, separated by a narrow process ; mesosternum not strongly depressed, middle and posterior coxæ prominent, remote ; metasternum rather short with wide parallel episterna. First two abdominal segments little longer than two following, which are together equal to fifth. Legs long, tibiæ quite simple, flattened, slightly curved, obliquely excised at apex, with inner angle shortly spinose; fourth tarsal joint inserted near base of third, which is produced underneath into a long split lobe, but not laterally widened.

The one species of this genus has, at least in the male, more the appearance of a Curculionid or an Anthribid, than a Scolytid, owing to the prominent rostrum, the general shape of its body, the vestiture, and the unarmed tibiæ. It is, however, a true Scolytid, and either one of the *Hylesini*, or not remote from them. I know, however, of no described genus with which it is closely allied.

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Hyorrhynchus lewisi, sp. n.

Oblongo-ovatus, opacus, niger, pube sericea fusco-cinerea dense vestitus, antennis tarsisque ferrugineis; prothorace transverso, basi bisinuata, lateribus postice parcius, antice fortius rotundatis, supra post apicem longitudinaliter impresso, dense granulato; elytris post medium dilatatis, supra tenuiter striatis, fuliginosis, vitta transversa angulata et apice cinereis, interstitiis leniter convexis ad basim granulatis. Long. 3·5—5·3 mm.

Mas. Capite fortiter longitudinaliter sulcato, rostro longiore ad apicem in angulos prominentes lateraliter producto.

Fem. Capite subconvexo, rostro breviore; prothoracis lateribus antice muricatis.

Several examples taken at Sapporo, in 1883, by a native collector.

Head in the male produced obliquely forward into a flattened rostrum, the carinate sides of which form a sharp prominent and backwardly directed angle; upper divisions of the eyes rounded triangular, situated on either side of front, which is deeply furrowed between them, and finely carinate on the inner margin of each eye-segment; lower divisions of the eyes hidden from above by the lateral carina. Head in the female with a very short rostrum, narrowly carinate and not produced at sides, impressed over mouth and with a short median carina; in both sexes black, rugosely punctured with short close-lying hairs. Antennæ ferruginous. Prothorax narrowed in front, widest at base, with sides rounded; surface black, pilose, with short cinereous hairs, closely granulate and muricate at sides in the female, with a weak impression on either side towards the base. Scutellum rounded, pubescent. Elytra wider than prothorax, and more than twice as long, dilated behind middle, separately rounded at base, and overlapping thorax, inflexed below humeral angles to afford room for middle femora, sides nearly straight to behind middle, thence strongly rounded; surface covered with fine close-lying hairs, smoky-black except on humeral angles, apex, and an oblique angulated vitta, where they are cinereous, with fine incised striæ meeting at apex, as in *Hylesinus*, interstices subconvex, granulate at base. Underside black with fine close punctuation, pubescent. Legs piceous with tarsi lighter.

The sexual differences in the rostrum are not found in any other Scolytid known to me, and suggest those of the *Brentidæ*, with which this insect has no affinity.

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Sphærotrypes, nov. gen.

Caput oblongum, in rostellum haud productum. Oculi bipartiti. Antennæ lateraliter inter mandibulas et partem inferiorem oculorum insertæ, breves, funiculo 7-articulato, articulis latitudine crescentibus, clava ovata, rotundata, compressa, 3-articulata, vittis setarum transversis annulata, suturis transversis. Prothorax lateraliter marginatus. Mesosternum brevissimum, inflexum: metasternum breve. Coxæ anticæ et mediæ late distantes. Tibiæ anticæ ad apicem spinula unica extus producta armatæ, posteriores spinosæ. Tarsorum articuli 1–3 æquales, 3o bilobo.

Head flattened, oblong but not rostrate; eyes bipartite, the divisions flat, subtriangular, granulate and widely separated, united posteriorly by a fine carina. Antennæ inserted at upper angle of lower division of eye, short, their scape curved, slightly clubbed; funiculus with 1st joint large, globose, 2nd obconical, 3—7 transverse, increasing in width; club rounded oval, flat, with transverse sutures, 1st two joints transverse, together equal in length to 3rd, with transverse bands of short hairs, three on 1st joint, two on each succeeding joint, which give the club the appearance of being multi-articulate; apex of 3rd joint spongy, covered with short thick serrate hairs. Mandibles stout, prominent, not toothed. Maxillæ very hairy externally, inner margin convex, set with short flat spines; maxillary palpi short with joints equal in length, hairy. Submentum inconspicuous, produced into a short pointed process on either side of mentum, which is oblong, slightly narrowed at base and in middle of sides, with apex truncate; ligula small, ovate acuminate, inserted near apex of mentum; labial palpi short, joints 1 and 3 as long as broad, 2 transverse, densely hairy. Prothorax bordered at sides, excised in front to anterior coxæ, which are widely separated by a transverse prosternal process. Mesosternum very short, inflexed so that anterior and middle coxæ meet when the thorax is depressed. Metasternum barely larger than 1st abdominal segment, its episterna moderately wide, dilated anteriorly. Posterior coxæ separated by a broad rounded process of 1st abdominal segment, which is slightly longer than the 2nd, 3rd and 4th successively shorter, 5th about equal to 1st. Anterior tibiæ slightly dilated towards apex, outer margin almost simple except for a strong outwardly directed spine at apex and a smaller spine at inner angle; hinder tibiæ slightly curved, spined externally. Tarsi with 3rd joint bilobed, its processes long and narrow.

In spite of the divided eyes, I think this very distinct

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genus may be placed at present in the *Hylesini*, near *Dendrosinus*, which resembles it in shape, and in the structure of the antennal club. The peculiarities of the underside are due to its globose form, and consequent compression. The elytra are separately curved at base, but are not elevated above the base of the prothorax.

Sphærotrypes pila, sp. n.

Brevissime ovatus, fere globosus, niger, elytris piceis, antennis tarsisque ferrugineis; capite supra os transverse impresso, reticulato punctato, fronte pilosa; prothorace valde transverso, anterius fortiter angustato, basi postice obtuse producta, subtilissime marginata, supra post apicem transverse impresso, dense punctato, subnitido, parcius squamoso, linea media elevata laevi: elytris striato-punctatis, punctis obsoletis, interstitiis planis, squamatis, squamis pro maxima parte fuscis, interdum praecipue versus apicem cinereis. Long. 2·4—3 mm.

Hitoyoshi, several examples; it has occurred in the thin bark of a camellia.

Very short oval, exceedingly convex. Head with front flat in female, impressed in male, punctured, and thinly hairy, the hairs ascending on to middle of vertex, which is smooth at the sides, finely reticulate and scantily punctured. Prothorax nearly double as wide as long, its base bordered and produced backwards to form an obtuse angle, and slightly concave on either side, basal angles acute, sides rounded and strongly narrowed from base to apex; dorsum separated throughout from flanks by a fine ridge, convex, transversely impressed behind apex, with close rugose punctuation and a narrow elevated line from base to middle, somewhat shining with a scanty covering of scales, chiefly at apex and on sides, its anterior border fringed with short hairs. Scutellum oblong, rugose. Elytra rather wider than prothorax and less than twice as long, conjointly emarginate at base, basal borders slightly rounded, crenate, not overlapping base of thorax, basal angles very broadly rounded, sides rounded from base to apex; above dull brown covered with fuscous scales and with a dusty appearance, due to scattered cinereous scales; striate, the striæ rather deep, with obsolete and scattered punctures, interstices quite flat, rugose, more strongly at base. Underside black, punctured, thinly covered with scales. Legs blackish with tarsi lighter.

[The following species, though not from Japan, is so closely allied that it may well be described here:

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Sphœrotrypes globulus, sp. n.

Brevissime ovatus, niger, elytris piceis, antennis et tarsis rufescentibus ; capite reticulato, punctato, fronte squamulosa, subtuberculata, obsolete carinata ; prothorace transverso, anterius fortiter angustato, basi postice acutius producta, marginata, post apicem constricto, dense et rugose punctato, linea media elevata obsolescente, opaco, densius squamoso ; elytris striato-punctatis, interstitiis planis, rugosis, squamis fuscis passim obscure dilutioribus obtectis. Long. 2·4—3 mm.

INDIA, Belgaum ; taken by Mr. H. F. Andrewes.

Differs from the preceding as follows :—

Front of head tuberculate, more strongly covered with short scales with a few longer ones at sides, and usually distinctly carinate over the mouth, sometimes throughout less impressed in the male. The carina is variable, and a trace of it exists in *S. pila*. Prothorax more strongly angulate behind, its central line nearly obsolete, the surface quite dull with closer punctures and more scales. Scales of the elytra brown, occasionally a little lighter, but not evidently pale and cinereous, as in *S. pila*, except a few at the apex of the suture.]

HYLESINUS, Fabr.

The six Japanese species are all new. They may be thus distinguished :—

1. Prothorax not closely covered with scales 2
   and elytra closely covered with chequered scales *scutulatus*.
2. Alternate interstices of elytra elevated towards apex . . . 3
   Interstices similar towards apex 4
3. Elytra glabrous, size under 4 mm. . . . . *costatus*.
   hairy at apex, size 6 mm. . . . . *nobilis*.
4. Elytra unicolorous black 5
   with a transverse vitta of light scales . . . *cingulatus*.
5. Form broadly ovate, elytra less convex longitudinally than abdomen . . . . . *laticollis*.
   oblong ovate, elytra not less convex than abdomen *tristis*.

Hylesinus costatus, sp. n.

Oblongus, subnitidus, fere glaber, niger, elytris picinis, antennis tarsisque ferrugineis ; prothorace transverso, basi vix producta, lateribus rotundatis, granulato-punctato, linea media obsolete

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elevata, lateraliter versus apicem muricato; elytris prothorace plus quam duplo longioribus, subcylindricis, striato-punctatis, interstitiis usque ad declivitatem transverse rugosis, 1o, 3o, 5o, 7o in declivitate elevatis, seriatim tuberculatis, ceteris punctatis. Long. 3·4 mm.

Junsai; one specimen.

Oblong, black, with elytra obscurely piceous. Head with labrum pitchy, separated by a transverse depression from front, which is flattened, shining, strongly punctured and glabrous; vertex finely reticulate. Antennæ ferruginous, club small, pointed, sutures transverse. Prothorax transverse, base biconcave, depressed, scarcely produced in middle, sides strongly rounded; surface convex, finely reticulate and with strong asperate punctuation somewhat weaker at base, with traces of a central elevation: sides tuberculate before apex. Scutellum small, punctured. Elytra wider than prothorax and two and a half times as long, their bases convex, overlapping thorax, sides parallel to middle, then rounded to apex, surface convex cylindrical, strongly declivous behind, with strong punctured striæ, the punctures round and distinct; all interstices transversely rugose and punctured to middle, 1, 3, 5, 7 and 9 after middle with a series of transverse asperities which become strongly tuberculate on the apical declivity, where the interstices are elevated; alternate interstices not asperate behind middle, multipunctate. Underside black, punctured, shortly pubescent, metasternum with a deep longitudinal impression, its episterna not very narrow; abdomen scarcely convex longitudinally, its terminal segment rugose. Tibiæ spined externally.

In the flatness of the abdomen this species differs from the majority of the genus, except the sub-genus *Pteleobius*, Bedel, to which it is not related.

. . . . *Hylesinus nobilis*, sp. n.

Oblongo-ovalis, obscurus, niger, antennis tarsisque piceis; prothorace transverso, basi producta, lateribus versus apicem subangustatis, æqualiter granulato-exasperato, brevissime piloso; elytris prothorace plusquam duplo longioribus, ad basim angustatis, lateribus anterius subtiliter, posterius fortiter rotundatis, apice emarginato, profunde striato-punctatis, interstitiis rugulose tuberculatis versus apicem breviter pilosis, 1o, 3o, 5o subelevatis. Long. 6·2 mm.

Sapporo; one specimen.

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Oblong-oval, black, dull. Head finely aciculate with scattered punctures, front flattened, shortly pubescent, antennæ pitchy-brown with club blackish, longer than funiculus, bluntly pointed, its sutures oblique. Prothorax transverse, base strongly produced behind and biconcave, sides strongly rounded behind, contracted in front and sinuate, apex nearly straight in middle ; surface slightly impressed in middle behind apex, not distinctly impressed before base, uniformly and densely granulate, with short pubescence. Elytra wider than prothorax in middle and more than twice as long, humeral angles very obtuse, sides rounded at base, becoming wider, thence nearly straight, gradually and strongly rounded towards apices which are separately rounded ; surface convex, more strongly towards apex, with deep indistinctly punctured striæ ; interstices in front strongly tuberculate, with a few scattered hairs, posteriorly with rugosities weaker, hidden by short fuscous hairlike scales, and with a single row of erect setæ ; 1st, 3rd and 5th elevated at apical declivity, the two latter conjoined. Underside punctured and finely pubescent, abdominal segments not very convex. Legs black, with tarsi lighter, anterior tibiæ distinctly spined on outer side of apex.

The largest species in the genus.

Hylesinus laticollis, sp. n.

Ovalis, convexus, obscurus, breviter pilosus, niger, antennis ferrugineis, prothorace fere duplo latiore quam longiore, basi valde producta, lateraliter fortiter rotundato, supra rugose exasperato, lateribus antice muricatis, linea media obsoleta laevi, ante basim utrinque oblique impresso ; elytris prothorace plus quam duplo longioribus, versus apicem oblique declivibus, striatis, striis ad medium uniseriatim punctatis, postice laevibus ; interstitiis similibus, antice tuberculatis, postice squamulis brevibus fuscis vestitis, margine laterali breviter setoso ; abdomine valde convexo ad apicem setoso. Long. 4—4·2 mm ; lat. 2·2—2·3 mm.

Three examples, taken by a native collector at Sapporo in 1883.

Broad oval, convex, black. Head strongly punctured, front flattened, shortly hairy ; in two specimens, probably males, impressed over mouth with a fine central carina, and with stronger pubescence ; in the other, probably a female, with impression and carina obsolete and hairs scantier ; epistoma shortly produced over mandibles, vertex reticulate. Antennæ ferruginous, club long,

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stout, with transverse sutures. Prothorax very transverse, narrowed from base to apex, with sides rounded, base strongly produced in middle, surface asperately punctured, with short bristles, closer at sides, with an indistinct smooth central line, and an oblique impression on either side before and parallel to base; sides muricate towards apex. Scutellum rounded, rugose. Elytra wider than prothorax and two and a half times longer, widest in middle, base of each strongly rounded and crenate; sides slightly rounded to middle, gradually more strongly towards apex, which is obtuse; surface obliquely and not strongly declivous to apex, with deep rather wide striæ, obsoletely punctured to middle, thence smooth, interstices coarsely tuberculate at base, the tubercles becoming finer, and being replaced behind the middle by short fuscous scales, which give the elytra a brownish tinge; the two outer interstices and lateral margin with a close covering of short bristles. Underneath coarsely punctured, shortly hairy; abdomen more convex longitudinally than elytra, first two segments much longer than last three, fourth and fifth bristly. Spines of anterior tibiæ nearly obsolete.

Hylesinus tristis, sp. n.

Oblongo-ovalis, obscurus, niger, antennis tarsisque ferrugineis; prothorace transverso, basi brevius producta, lateribus rotundatis, versus apicem muricatis, supra asperate punctato, utrinque ante basim impresso; elytris prothorace sesqui amplius longioribus, lateribus ad medium subrectis, postice rotundatis, apice subtiliter emarginato, striatis, striis ad basim modo obsolete punctatis, interstitiis transverse asperatis, postice squamulis cinereis inconspicuis vestitis, margine laterali in versura solum distincte setoso. Long. 3—3·5 mm.; lat. 1·5—1·9 mm.

Mas. Fronte impressa, interstitiis post medium seriatim tuberculatis.

Several specimens taken at Ichiuchi, May 1st, 1881, and a few at Junsai.

Similar in sculpture and appearance to *H. laticollis*, but smaller, more oblong-oval, less strongly convex, the elytra more declivous behind, as convex as ventral surface. Front in male broadly impressed between eyes with a short central carina, pubescent; in female, narrowly impressed over mouth, flat between eyes, with pubescence thin. Prothorax less transverse than in *H. laticollis*, with sides less narrowed to apex, and base less strongly produced in middle, its sculpture similar. Elytra narrower, subparallel to middle, less obtuse at apex, interstices less coarsely tuberculate at base, alternate interstices behind middle with an indistinct row

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of stronger tubercles in the male: lateral setæ shorter throughout, inconspicuous before middle of elytra. Anterior tibiæ distinctly spinose on outer margin.

Hylesinus cingulatus, sp. n.

Oblongo-ovalis, obscurus, niger, antennis tarsisque rufescentibus, sat dense et breviter pilosus: prothorace transverso, basi bisinuata, haud producta, lateribus æqualiter rotundatis, antice tuberculatis, supra dense granulato-exasperato: elytris ad medium lateribus subparallelis, at subsinuatis, postice rotundatis, supra striato-punctatis, squamosis, vitta fusco-cinerea transversa lateraliter versus apicem curvata notatis, interstitiis ad basin tuberculatis, postice subrugosis. Long. 2·3—2·8 mm.

Lake Junsai; five specimens.

About the size and shape of small examples of *H. fraxini*. Black, dull. Head closely granulate, front hairy, impressed in male, subconvex in female. Antennæ ferruginous, club rather broad, obtusely pointed, with dark pubescence. Prothorax with base bisinuate, not produced as in the two last species, sides rounded at base, thence narrower and straighter to apex: above uniformly convex, thinly hairy, without scales, granulate, the asperities stronger towards the sides, which are distinctly tuberculate in front. Elytra as wide as prothorax, and two and a half times longer, separately rounded at base, overlapping thorax, sides subparallel, feebly sinuate to behind middle, thence rounded; surface convex, obliquely declivous behind, striate, the striæ punctured to behind middle, interstices tuberculate at base, then rugose, covered with short hairs and scales, blackish except on middle of elytra, where they form a transverse cinereous-brown vitta, curved backwards at sides so as to cover the apices of the 5th to the marginal interstices, and continued narrowly along apical margin, forming an irregular oval. Underside punctured, with rather dense cinereous pubescence; abdomen not strongly convex. Legs ferruginous or pitchy, with tarsi lighter, front tibiæ hairy, spined externally.

Hylesinus scutulatus, sp. n.

Oblongus, niger, squamulis cinereis fuscisque tesselatus, antennis pedibusque nigrescentibus; prothorace vix latiore quam longiore, basi bisinuata, lateribus rotundatis versus apicem tuberculatis: elytris prothorace latioribus et illo duplo longioribus, cylindricis, striato-punctatis, interstitiis ad basim subtuberculatis, per totum uniseriatim setosis. Long. 2·7 mm.

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One or two examples taken at Kiga, Subashiri, Nagasaki, Omori, and Oyama.

Oblong, cylindrical, black, tesselated with close-lying grey and brownish scales. Head granulate with front flattened, hairy, impressed and more densely hairy in the male. Antennæ black, club rather short, acuminate oval, its basal joint large. Prothorax rather broader than long, its base bisinuate, not produced, sides uniformly rounded, tuberculate in front, surface regularly convex, front and sides with short erect bristles. Elytra cylindrical, wider at base than thorax, and a little more than twice as long, base crenate, sides subparallel to behind middle, apex strongly declivous and convex; with rather fine punctured striæ, interstices flat with a single row of setæ throughout, and with one or two tubercles at base. Underside strongly punctured with short scale-like hairs, metathoracic episterna narrow, abdomen not convex longitudinally. Legs black, with tarsi lighter.

Two specimens are larger and broader than the rest, the scales are pale ashy-grey and yellowish, whereas in the others they are light and dark brown. I believe the two former to be females and not specifically distinct. This species may be referred to Bedel's sub-genus *Pteleobius*, and is nearest to *H. vittatus*, Fabr., of the European fauna, but is larger, more elongate, with the striæ deeper and less clearly punctured, and the interstices more convex and distinctly setose.

Phlœosinus, Chap.

In the generic diagnosis given by Chapuis (Syn. Scol., p. 93), the third tarsal joint is stated to be simple. This is correct for the European *P. aubei*, Perr., and *P. thuyæ*, Perr., but in the Japanese species it is bilobed, though M. Chapuis has made no mention of this point in the descriptions of *P. lewisi* and *perlatus*. It is also bilobed in the American species, according to Leconte, except in his *Chætophlœus hystrix*, which can hardly be separated from the genus upon the characters given, and in which the 3rd tarsal joint "is emarginate rather than bilobed." This difference in structure is not here of generic value, and the genus is sufficiently recognisable by the structure of the antennæ.

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There are seven Japanese species, of which five are new.

TABLE OF SPECIES.

1. Head with a median carina immediately over mouth . . . 2
   not carinate over mouth 5
2. Elytra closely covered with scales, interstices alternately lighter and darker . . 3
   thinly covered with hairs or scales, unicolorous . . 4
3. Prothorax abruptly contracted in front, reddish-brown . . *pulchellus.*
   gradually contracted in front, black . . . *dubius.*
4. Elytra black, interstices similar, size small . . . . *minutus.*
   red-brown, 2nd interstice depressed and narrowed at apex *perlatus*, Ch.
5. Interstices without seriate bristles, 1st and 3rd tuberculate towards apex . . *rudis.*
   uniformly granulate, with seriate bristles . . . 6
6. Bristles on 2nd interstice ceasing before apex, front subcarinate between eyes . . *seriatus.*
   on interstices, similar throughout . . . . *lewisi*, Ch.

Phlœosinus pulchellus, sp. n.

Ovalis, rufo-testaceus, antennis pedibusque ferrugineis; capite nigro, punctulato, breviter piloso, vix rostrato, supra os fortiter carinato; prothorace transverso, antice abrupte contracto, supra convexo, linea media subelevata, rugose punctato et squamis adpressis haud dense vestito; elytris post medium subdilatatis, fortiter striato-punctatis, interstitiis planis, 2o, 4o, 6o muticis, squamis brunneis, ceteris versus apicem subtuberculatis, squamis flavo-testaceis vestitis. Long. 2·5 mm.

One specimen, Wada Toge.

Oval, convex, red-brown, elytra closely squamose with alternate lighter and darker stripes. Head impressed over mouth (probably a male character) with a strong frontal carina, punctured, and shortly hairy. Prothorax nearly one-half broader than long, strongly narrowed in front, sides behind nearly straight, then very convex at contraction, becoming straighter in front; base narrowly impressed, surface convex, slightly depressed at apex, and obscurely elevated in middle from base to apical depression, densely punctured and sprinkled with close-lying yellow scales. Elytra wider than prothorax and twice as long; basal margin crenate, everted at sides, humeral prominences obliterated sides subsinuate to beyond

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middle, thence rounded; surface slightly dilated at posterior third, then strongly convex to apex, closely squamose, the scales cinnamon-brown on the 2nd, 4th and 6th interstices, yellow on the rest of the elytra; striate, the striæ rather wide, with distinct punctures, interstices flat, granulate at base, 2nd widened at base and on summit of declivity, 1st, 3rd and outer interstices inconspicuously tuberculate towards apex. Underside ferruginous, scantily pubescent, strongly punctuate on metathorax and two first abdominal segments. Legs ferruginous, anterior tibiæ with strong outwardly directed spines at outer apical angle.

Phlœosinus dubius, sp. n.

Ovalis, niger, subopacus, antennis tarsisque ferrugineis; capite punctato-granulato, brevissime piloso, haud rostrato, fronte supra os deplanata, in medio carinata; prothorace transverso, antice gradatim contracto, supra convexo, linea media passim elevata, rugose punctato, parce squamoso; elytris subcylindricis, lateribus post medium subrectis, striatis, striis obsolete punctatis, interstitiis squamosis, squamis fuscis, in interstitiis 1o, 3o, 5o nonnihil dilutioribus, his versus apicem tuberculatis. Long. 2·2 mm.

One specimen, Kurigahara.

Very similar to *P. pulchellus*, with the appearance of being a colour variety, but differing in certain other points. Entirely black with only the antennæ and tarsi reddish; head less strongly impressed over mouth, and frontal carina less acute. Prothorax narrower, flatter throughout with the sides more gradually sloped towards the apex, and not strongly rounded in the middle, so that the apical constriction is less marked; punctuation less strong and interstices covered with fine reticulation, not evident in *P. pulchellus*. Elytra more oblique at base, with borders straighter, not evidently dilated behind the middle, the sides consequently not subsinuate, but straight to near the apex; humeral elevations small, distinct, black, covered behind the middle (the base is probably rubbed in the single specimen), with fuscous scales, which are obscurely lighter on the alternate interstices, as in *P. pulchellus*. Striæ finer, not evidently punctured, the 2nd interstice narrower and straighter throughout. Apical spines of the anterior tibiæ longer, curved backwards, and connate for the greater part of their length.

The two preceding species resemble small species of *Hylesinus* rather than *Phlœosinus*, owing to the thickness of their scaly covering; but they present no characters to separate them from the latter genus.

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Phlœosinus minutus, sp. n.

Ovalis, niger, subnitidus, antennis pedibusque infuscatis ; capite granulato, fronte subconcava, pilis flavis circumdata, supra os carinata ; prothorace transverso, antice contracto, lateribus in medio fortiter rotundatis, supra subtilissime reticulato et disperse punctato, punctis asperatis, elytris cylindrico-convexis, striato-punctatis, interstitiis planis subrugosis, uniseriatim subtiliter tuberculatis et squamulis erectis vestitis, 1o, 3o, 5o in margine apicali spinula unica armatis. Long. 1·5 mm.

One example, Ichiuchi.

Black ; head not rostrate, closely granulate, front impressed, concave, strongly punctured round margin, with a few longish hairs, carinate above mouth. Prothorax transverse, strongly contracted towards apex, base bisinuate, its angles broadly rounded, sides slightly rounded, more strongly at contraction, surface convex without median elevation; scantily pubescent, closely reticulate and asperately punctured, the punctures strongest towards apex, sparser over sides behind middle. Scutellum piceous, shining, punctiform. Elytra scarcely wider than prothorax and less than twice as long ; basal margins conjointly nearly straight, crenate at sides only ; sides straight to middle, thence uniformly rounded ; above shortly cylindrical and very strongly rounded at apex, pitchy-black with punctured striæ, the punctures not close, interstices flat, shining, subrugose, with irregular rows of erect scales and minute tubercles, 1st, 3rd, 5th and 7th with one or two stronger tubercles towards apex and a sharp pointed spine just above lower border of elytra. Legs piceous with tarsi lighter. Third joint scarcely bilobed.

The smallest species as yet in the genus, with a deceptive resemblance to *Phlœophthorus rhododactylus*, Marsh. (*spartii, auct.*), but separable by the point of attachment of the antennæ, the broader and anteriorly contracted thorax, which is finely reticulate as well as punctured, and the apical spines of the elytral interstices.

Phlœosinus perlatus, Chap.

Chap., Scol. Jap., p. 198.

Originally from Hiogo ; one or two fresh specimens are without indication of locality. The only sexual character

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is that the front is impressed and concave in the males, flat in the females. The length, inaccurately given by Chapuis, is 2·5—3 mm.

Phlœosinus seriatus, sp. n.

Oblongo-ovalis, subopacus, breviter pilosus, niger, elytris rufo-brunneis vel nigris, antennis tarsisque ferrugineis; capite subrostrato, fortiter punctato, fere glabro, supra os impresso; prothorace antice constricto subtransverso, supra convexo dense ac fortiter punctato, linea media abbreviata lævi nitida; elytris pube brevissima vestitis, striato-punctatis, punctis rotundis sat frequentibus, interstitiis passim convexis, rugosis, serie unica setarum ornatis, 1o, 3o versus apicem tuberculatis, setosis, 2o, 4o muticis, in declivitate haud setosis, margine laterali per totum spinulis minutis armato. Long. 2·4 mm.

Mas. Fronte media impressa, et linea elevata laevi inter oculos ornata.

Fem. Fronte deplanata, linea media laevi haud elevata.

A pair, Higo.

Oblong-oval, black, or with elytra reddish-brown; head subrostrate, strongly punctured, with an arcuate impression above mouth and a second smooth impression above that in male, at which ends the short frontal median shining line, which is elevate though scarcely carinate in the male, flat in the female; antennæ ferruginous. Prothorax transverse, its basal angles rounded, sides strongly contracted towards apex, in the male almost angulated, above convex without central elevation, but with a median smooth line, which does not reach either border, covered with short close hairs, densely and strongly punctured and not asperate. Elytra with basal borders rounded, scarcely everted at sides, sides straight in front, rounded posteriorly and slightly sinuate at apex of 4th interstice when seen from above; surface subdilated behind middle, thence convexly declivous, covered with short hairs, striæ weak with large round close punctures; interstices with traces of tuberculation throughout, evident at base and on alternate interstices towards apex, where the 2nd interstice is depressed as in *P. perlatus*, more strongly in the male than in the female, and a single series of bristles, absent on alternate interstices, towards the apex; marginal interstice with a row of short spines throughout, stronger towards apex. Legs pitchy with knees and tarsi reddish. Underside black, punctured and covered with squamous hairs.

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Very similar to *P. perlatus*, Chap., from which it may be distinguished by its smaller size, the absence of a carina on the epistoma, the frontal median elevation not reaching to the mouth, by the absence of a longitudinal elevation from base to apex of the thorax, by the shallower and evidently punctured elytral striæ and the distinct rows of bristles on the interstices, which are alternate towards the apex; a similar row of scale-like bristles occurring in *P. perlatus* cannot be distinguished from the general covering with a lens. The alternation of these bristles will also differentiate it from *P. lewisi*.

Phlœosinus lewisi, Chap.

Chap., Scol. Jap., p. 198.

Numerous specimens, Kashiwagi, Chiuzenji, Kobe and Nowata.

Varies in size from 1·8 to 2·3 mm.

Phlœosinus rudis, sp. n.

Ovatus, subnitidus, niger, elytrorum apice nonnunquam dilutiore antennis tarsisque ferrugineis; capite vix rostrato, oculis exacte planis, vix emarginatis; prothorace transverso, basi in medio producta, lateribus rotundatis, versus apicem leviter sinuatis, supra convexo, dense et fortiter punctato, parcius piloso; elytris oblique declivibus supra breviter pilosis, striato-punctatis, interstitiis planis granulatis, versus apicem uniseriatim tuberculatis. Long. 2·7—3 mm.

Mas. Interstitiis 1o, 3o in declivitate tuberculis magnis, discretis ornatis, 2, 4 inermibus.

Fem. Interstitiis 1o, 3o in declivitate subtilius tuberculatis, 2o subtilissime.

Kashiwage and Kobe.

Black, oval; head strongly punctured, front flattened in female, impressed in male, almost glabrous, except for a few hairs over mouth and a few on vertex in female, eyes perfectly flat. Prothorax transverse, its base produced in middle towards scutellum, slightly contracted towards apex with sides rounded from base; convex, somewhat shining, strongly and closely punctured without asperation, usually with a median shining longitudinal line.

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Scutellum round, full, punctured. Elytra scarcely wider than pronotum and rather less than twice as long, their basal borders rounded, crenate, slightly everted, sides straight at base, rounded from middle to apex: above gradually declivous almost from base, black, with apex sometimes piceous, with short scanty pubescence, without scales or coarse hairs, striæ rather fine, indistinctly punctured at base, nearly smooth towards apex, interstices granulate to middle, then 2nd and 4th in male smooth, multi-punctate, with one or two tubercles before apex, in the female with a few fine tubercles throughout: 1st in male with about 5, 3rd with about 7 strong spinous tubercles, which do not unite to form a crest, in female with smaller tubercles: outer interstices towards apex with rows of tubercles in both sexes. Underside black, punctured, pubescent: metasternum rather prominent. Legs black with tarsi lighter.

The largest Japanese species and the only one allied to the European species in appearance and sexual characters.

Polygraphus, Er.

Of all the genera of the family, this one, considering its small extent, is the most difficult to deal with. Till recently it included but two species, *P. poligraphus*, Lin., and *rufipennis*, Kirby, but Thomson has added three others found in Europe, of which I have seen but one, *P. grandiclava*, or rather an insect forwarded to me by Herr Reitter as *P. poligraphus*, var. *grandiclava*. I have also had before me an Indian species, and there are apparently three distinct forms from Japan. Well-marked differences are wanting amongst all these insects, which are almost identical in structure and sculpture; and the difference of appearance which can be seen in comparison of examples vanishes in the most elusive way when an attempt is made to define and embody it in a description.

It is possible that the structure of the male organs will be of assistance here, as Lindeman has shown that they are often distinct in closely-allied Scolytids. But for satisfactory examination of these, series of a certain length are required, and have not been forthcoming. I can therefore but echo the words of Leconte who, in treating of the almost equally difficult genus *Dendroctonus*, wrote: "If I have failed to indicate more strongly the differences

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between these species it is because they are not distinguished by any prominent or definite characters; and the student, who may have difficulty in identifying the species as here defined, would have almost equal difficulty if the specimens in my collection were before him."

Polygraphus oblongus, sp. n.

Oblongus, subnitidus, niger, elytris apice rufescentibus, squamis flavo-cinereis vestitus; clypeo emarginato, oculis subconvexis, antennarum clava oblonga infuscata acuminata; prothorace antice fortiter constricto, linea media subelevata, punctis subaciculatis sat densis notato; elytris versus apicem subdilatatis, tenuissime striatis, ad basim granulatis. Long. 3·2 mm.

Mas. Fronte subconvexa, breviter pilosa.

Fem. Fronte convexa, bituberculata, brevissime pubescente.

Four examples, Chiuzenji and Subashiri.

Oblong, black, with elytra becoming gradually reddish towards apex. Head with front slightly convex in male, rugosely punctured and rather dull, pubescence short, in female convex, shining, very shortly pubescent, with two distinct tubercles in middle, below them with slight impression, clypeus emarginate in middle, eyes feebly convex, more distinctly in female, antennal club rather large, infuscate and evidently acuminate at inner side of apex, more strongly in male than in female. Prothorax nearly half as broad again as long, strongly constricted towards apex with sides more convex behind constriction than at base; surface rather shining, with close subaciculate punctuation and thin squamous covering; median line slightly elevated, variable in length and distinctness. Elytra more than half as long again as prothorax, one-third longer than wide, slightly but discernibly dilated towards apex, dull, scales close, cinereous with a yellow tinge, striæ faint but distinguishable throughout, weaker at apex in female than in male. Legs dark, ferruginous, with tarsi lighter; all tibiæ spined at apex.

When compared with *P. poligraphus*, this species differs in its larger size, infuscate elytral club, thinner frontal pubescence, shorter and more constricted prothorax. The elytral apex is lighter in colour, and this does not appear to be due to immaturity. The punctuation of the head in the female is more distinct.

Polygraphus proximus, sp. n.

Antecedenti omnibus simillimus, sed brevior, elytris ad apicem

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distinctius rufescentibus, non dilatatis, striis minus perspicuendis. Long. vix 3 mm.

Two examples, Sapporo.

The two specimens I have included under this title differ principally in shape from the preceding species. They are distinctly shorter, particularly in the elytra, which are not more than one-fourth longer than wide, and are not dilated towards the apex, which is slightly flattened. The head is similar, the antennal club less deeply infuscate. Prothorax transverse and strongly constricted, the median line well-marked and elevated at the base, more so than in the specimens of *P. oblongus*, where it is nearly obsolete, rather more shining and less closely punctured, the punctures subaciculate. Elytra more abruptly and distinctly reddish towards apex, their striæ less distinct. Posterior tibiæ feebly spined.

One example is rubbed bare, and its appearance is materially altered, the pubescence on the other is not intact, but appears to be a little less close than in *P. oblongus*. Both are females.

Polygraphus miser, sp. n.

P. oblongo similis sed minor, angustior, antennarum clava vix acuminata, prothorace anterius minus angustato, post apicem haud constricto; elytris ad basim magis infuscatis, tenuiter striatis, squamis subtilioribus; pedibus ferrugineis. Long. 2·4 mm.

Four specimens, Nikko.

Hardly to be distinguished from *P. oblongus* except by its smaller size, which is quite noticeable when the specimens from each locality are compared side by side.

In shape narrower, with the prothorax less transverse and constricted in front, and the elytra proportionately shorter. Antennæ entirely testaceous, with the club not acuminate; prothorax more shining, less squamous and more sparingly punctured, the punctures but feebly aciculate; one example shows a median raised line, the other three not. Elytra with basal half darker and more abruptly contrasted with the shorter and lighter apical half, with rather thinner squamous covering, and more distinct striæ. Head in the female duller, more punctured and less convex, front bituberculate; in the male narrower.

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Scolytus, Geoff.

One species has been described by Chapuis. I add five more, and there is possibly one other. They present the uniformity in appearance characteristic of this widely distributed genus. The species were principally obtained from birch.

Table of Species.

1. Second abdominal segment unarmed 2
   with a median process . . *claviger.*
2. Abdomen concave, its 3rd and 4th segments with a tubercle on apical margin . . . . . *esuriens.*
   not concave, 3rd and 4th segments simple . . . 3
3. Apex of elytra finely serrate near suture (size 4½ mm.) . *agnatus.*
   simple 4
4. Alternate interstices of elytra with an irregular double row of punctures . . . . . *frontalis.*
   All interstices with a single row of punctures 5
5. Elytra brown, strongly punctured in rows . . . . . *aratus.*
   black, finely punctured, with oblique aciculate scratches . . . . . *japonicus*, Ch.

Scolytus esuriens, sp. n.

Nitidus, niger, elytrorum lateribus et apice nonnunquam rufescentibus, antennis pedibusque ferrugineo-piceis; prothorace longitudine vix latiore, punctato, linea media lævi; elytris lateribus subrotundatis posterius vix angustatis, apice conjunctim subtruncatis, fortiter striato-punctatis, striis impressis, interstitiis planis subtiliter uniseriatim, 3o saltem biseriatim, punctatis; abdomine concavo, segmento 1o margine prominulo, 3o et 4o in margine medio tuberculo parvo ornatis. Long. 3·8—5·5 mm.

Mas. Fronte deplanata breviter pilosa.

Fem. Fronte subconvexa parcissime pilosa, vertice subnitido, discrete punctato. Long. 3·8—5·5 mm.

Several specimens taken at Junsai, and single examples at Miyanoshita and Chiuzenji.

Nearly allied to *S. geoffroyi*, Goetze.

Black with sides and apex of elytra more or less reddish. Front of head flattened in male and not impressed, with short pubescence, subconvex in female, impressed over mouth, and thinly hairy; vertex in female convex, with a median impressed line shining and diffusely punctured. Prothorax with a shallow impression on either side, more strongly punctured than in

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S. geoffroyi, the central impunctate line sometimes obsolete. Elytra not evidently narrowed behind, their apices conjointly rounded, nearly truncate, with striæ deeper than in *S. geoffroyi* and more strongly punctured, interstices somewhat less flat, finely punctured in rows, the 3rd and in larger specimens the 5th or 7th with irregular double rows; punctuation of outer interstices strong at base. Abdomen with apical margin of 1st segment prominent, thickened in middle and shining, 2nd segment concave, 3rd and 4th with a small median tubercle on margin, 5th with a longitudinal impression near apex. Metasternum shining, diffusely punctured.

Variable in size, in the width and number of punctures of interstices, which are sometimes partly striate.

One example from Junsai is smaller, with the elytra longer and narrower, and separately rounded at apex, the 3rd interstice has a double row of punctures at the base only, and the outer interstices are strigose with indistinct punctures. The underside does not differ, though the tubercles are inconspicuous. It appears to be an ill-developed example.

Scolytus agnatus, sp. n.

Nitidus, niger, elytris apice rufescentibus, antennis pedibusque piceo-ferrugineis; prothorace latitudine et longitudine fere æquali in disco subtiliter, in lateribus fortius punctato; elytris lateraliter subrotundatis, postice angustatis, in apice singulatim rotundatis, margine apicali subtiliter serrato, punctato-striatis, striis non impressis, interstitiis angustis subrugosis, singulariter seriatim quam striis vix subtilius punctatis; abdomine deplanato, segmentis 3o et 4o muticis. Long. 4·6 mm.

Fem. Fronte subconvexa, glabra, vertice obscuro, dense ac rugose punctato.

Two specimens taken at Junsai in company with the last species.

Very like *S. esuriens*, and readily confounded with it.

Black, with apex of elytra reddish. Head in the female (I have not seen the male) quite glabrous, its vertex dull, rugosely and closely punctured. Prothorax similar, but without lateral impressions. Elytra larger, more evidently narrowed towards the apices, which are separately slightly rounded, the whole posterior margin finely toothed. Punctures of the elytral striæ stronger, somewhat irregular and not distinctly impressed, interstices narrow, punc-

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tured nearly as strongly as the striæ in irregular series, which are not double, except at base; somewhat rugose, and with slight longitudinal impressions. Punctures of the sides of the elytra much stronger than in *S. exuriens*. Abdomen not concave, margin of the 1st segment not prominent but sloped upwards, 3rd and 4th unarmed, the 5th transversely impressed. Metasternum closely and rugosely punctured.

Scolytus frontalis, sp. n.

Oblongus, nitidus, niger, elytris rufo-brunneis, antennis pedibusque ferrugineis; capite (in maribus saltem) oblongo, fronte impressa, strigose aciculata, pilis longis crispatis circumdata; prothorace haud transverso sat fortiter punctato, linea media laevi, punctis in disco paullo subtilioribus, magis discretis; elytris prothorace fere dimidio longioribus, lateribus subrotundatis, postice angustatis, subtiliter punctato-striatis, striis non impressis, interstitiis irregulariter vix subtilius seriato-punctatis, 1o, 3o, 5o biseriatim, subrugosis; abdomine subconvexo, margine segmenti 1mi haud prominulo, cum ceteris mutico. Long. 3·6—4·3 mm.

Three examples taken at Fukushima.

Resembling *S. pruni*, Ratz., in appearance, but with the prothorax more strongly punctured, and the elytral striæ much less regular. Black with anterior margin of thorax and elytra red-brown. Head (in the male, to which sex the specimens belong) oblong, produced in front, and impressed, with long aciculate scratches from mouth to vertex, margined with long curled yellow hairs, median line finely carinate, epistoma subcircularly emarginate. Prothorax about as long as broad with moderately strong oval punctures, closer and deeper at sides. Elytra as wide in middle as prothorax, and nearly one-half longer, narrowed behind, rather abruptly rounded at apex and feebly emarginate at suture; surface little depressed round scutellum, with fine irregular rows of punctures, interstices narrow and flat, with slight transverse or oblique wrinkles, their punctures little finer than and not readily distinguishable from those of striæ, forming an irregular double row on 1st, 3rd and 5th interstices, and a single row on remainder, except at base where they are irregular. Underside piceous, lighter at sides, thinly pubescent; abdominal segments simple, margin of 1st not prominent.

Scolytus aratus, sp. n.

Nitidus, niger, elytris piceo-brunneis, basi cum pedibus rufescente; capite convexo, subtiliter aciculato, parcissime piloso; prothorace non

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transverse, fortiter punctato, punctis ovatis in medio disco magis discretis, subtilioribus; elytris prothorace dimidio longioribus, lateribus subrotundatis, postice angustatis, margine apicali subtruncato, fortiter lineato-punctatis et substriatis, interstitiis angustis uniseriatim punctatis, punctis vix subtilioribus, seriebus nonnunquam irregulariter impressis; abdomine convexo, mutico, piloso. Long. 3 mm.

Mas. (?). Abdominis segmento 5o pilis longis ornato.

Fem. (?). Abdominis segmento 5o breviter piloso.

Junsai, two specimens.

Allied to *S. carpini*, Ratz., but with stronger thoracic punctuation, and elytral striæ more impressed with coarser punctures. Black with elytra pitchy-brown. Head convex, finely aciculate and glabrous, without sexual differences; vertex dull, closely punctured. Prothorax as long as broad, with strong oval punctures, scattered on disc, closer, deeper and rugose at sides and apex. Elytra as wide as thorax and one-half longer, with lateral margins slightly rounded to behind middle, then narrowed; apical margin nearly truncate, feebly excised at suture, and slightly irregular, but not serrate as in *S. agnatus*; surface with regular rows of strong punctures, deeper and closer at base, slightly impressed throughout, interstices narrow, with a single series of punctures rather weaker than those of striæ, and sometimes impressed, first and second with a few oblique wrinkles. Abdomen convex, covered with short hairs; last segment in male (?) emarginate at apex and impressed, with a fringe of long hairs.

Smaller than any other Japanese species except *S. japonicus*, which is readily distinguished by its black colour, and the absence of striate impressions on the elytra, the punctures of which are fine and obscured by oblique wrinkles.

Scolytus japonicus, Chap.

Chap., Scol. Jap., p. 199.

A single further specimen of this species, the representative of the European *S. rugulosus*, taken at Junsai. It attacks the plum-tree.

Scolytus claviger, sp. n.

Subelongatus, depressus, niger, elytris piceis, antennis pedibusque rufescentibus; prothoracis disco parce punctato, punctis versus basim subtilioribus; elytris regulariter striato-punctatis,

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striis vix impressis, interstitiis paullo subtilius uniseriatim vel irregulariter biseriatim punctatis, depressione apicali ad latera serie tuberculorum intus marginata. Long. 3·7 mm.

Mas. Fronte impressa, longius pilosa ; abdominis segmento 2o processu oblongo deplanato versus apicem incrassato et recurvato armato.

Fem. Fronte subconvexa, parce pilosa ; abdominis segmento 2o tuberculo brevi conico armato.

A pair taken at Kiga.

Elongate and depressed, black with elytra piceous. Head with front strongly impressed in male and margined with long curled hairs, in female subconvex and strigose with scanty pubescence ; vertex strongly punctured in both sexes. Prothorax as long as broad, with sides nearly parallel behind middle, not strongly contracted in front, its punctuation rather strong, not close, weak over base only. Elytra as wide as prothorax and one-half longer, very slightly rounded at sides and narrowed behind, apex serrate and feebly emarginate ; surface with regular impressed rows of punctures, interstices narrow with subimpressed rows of rather weaker punctures, tending to become double on alternate interstices. Apical impression extending along sides of elytra and bordered within, above outer angles, by six or seven small tubercles. Underside black, abdomen reddish at sides, its first ventral segment prominently bordered, second in male with an oblong process, flattened vertically, its tip thickened and recurved upwards ; in female with a short pointed tubercle, and rather dense pubescence.

Allied to *S. multistriatus*, but differing in the structure of the abdomen, and the stronger punctuation, the thoracic punctures being more scanty. The apical segments of the abdomen, nearly horizontal in the male example, are unfortunately missing in the female, which prevents comparison with another specimen from Nishi, which appears distinct, but cannot be separated by any definite characters ; it is rather larger, more convex, the thorax is more evidently narrowed in front, with the sides rounded behind ; the elytra are darker and broader ; the abdomen is nearly vertical, armed as in the female type. This insect does not show any differences in sculpture that are of specific value, though the thorax is more finely punctured behind the middle. It must be separated, if at all, on further examples of both sexes.

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TOMICINI.

Crypturgus, Er.

C. pusillus, Gyll, has already been recorded from Japan by Eichhoff (Rat. Tom., p. 74), who examined specimens taken by Hiller in Nipon, and could discover no difference between them and European examples. Mr. Lewis has taken a series on Fujisan and at Subashiri in which the pubescence on the elytra is scanty, fine and less distinguishable than in European specimens, but which have no other well-marked distinguishing features. The prothorax is rather strongly narrowed behind, but its shape is variable in European examples.

Cryphalus, Er.

At present the Japanese *Cryphali* are represented by a single specimen only in Mr. Lewis's collection. As the genus is very common in the Oriental region, and there are some ten European species, it is probably much more numerous in Japan than it appears to be at present.

Cryphalus exiguus, sp. n.

Oblongo-ovalis, convexus, opacus, niger, squamosus; prothorace semi-orbiculato, margine antico bituberculato, anterius tuberculis discretis in plaga postice producta exasperato, posterius rugose punctato; elytris latitudine longioribus, lineato-punctatis, interstitiis squamosis setis erectis raris ornatis. Long. 1·3 mm.

One example, Fukushima.

One of the smallest species in the genus.

Oblong-oval, convex, dull black with a covering of grey scales. Head with front subconvex, reticulate, punctured at sides, impressed over mouth and with an obtuse median elevation separated above from vertex by a sharp transverse shining carina; eyes oblong-oval, anteriorly emarginate; antennæ testaceous with club deeply infuscate, roundish oval, its basal joint shining, with superior apical border rounded, fringed, remaining joints pilose with border less strongly rounded. Prothorax narrowed towards apex, rather broader than long, its base bisinuate with narrowly elevated margin, basal angles rounded when seen from above, sides and apex rounded throughout, the latter more strongly, its

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margin with two prominent tubercles in middle; surface uniformly convex, not gibbous, anteriorly with scattered asperate elevations, forming a patch angulately produced behind but not reaching very near base, interstices and remainder of surface finely reticulate and rugosely punctured, with thin covering of scales and hairs. Scutellum very small, triangular. Elytra as wide as prothorax, and not quite half as long again, slightly and separately rounded at base, humeral angles rather obtuse, but not rounded, shoulders finely elevated, sides nearly straight and subparallel to posterior third, then broadly rounded to apex; surface transversely convex, subcylindrical to behind middle, then obliquely declivous and convex to apex, with distinct rows of punctures, the outer ones obsolete towards apex, interstices narrow, finely multipunctate and squamous, with a single series of scattered erect setæ. Legs fuscous with tarsi testaceous.

This species can be distinguished from other described *Cryphali*, in which the eyes are emarginate and the elytra not rounded from base to apex, by the two tubercles on the anterior margin of the prothorax. Among the European species it is most like *C. abietis*, Ratz, but is much smaller, with the elytral striæ not impressed, and the antennal club and legs darker. The transverse carina which borders the vertex of the head in front occurs in some Ceylonese species in my hands, and is probably a sexual character. As with other Oriental *Cryphali*, the joints of the antennal club have a rounded margin on their superior surface, which is less evident below. In this respect they approach Thomson's subgenus *Ernoporus*, which can be characterised by the non-emarginate eyes alone.

Hypothenemus, Westw.

I take this genus, as has been done by Leconte and others, to be inclusive of Eichhoff's genus *Stephanoderes*, which it is not possible to separate by means of the number of articulations in the antennal funiculus. But it is not to be supposed, as Leconte has suggested, that the variations of this structure are of no generic value in *Scolytidæ*. In the majority of genera which can be separated by them, there are other structural features, or at least a difference of *facies*, which tend to show that they are a reliable guide. In the *Hypothenemi*,

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however, the smallest insects of the family, it would appear that reduction in size leads to a reduction in the number of joints, without involving other structural features. But we really require to study its structure in more species of this difficult and little-known genus.

I add two more species to the one already described from Japan.

Hypothenemus tristis, Eichh.

Stephanoderes tristis, Eichh. Scol. Jap., p. 200; Rat. Tom., p. 150. No further examples have been taken, unless the following insect be a variety of this species.

Hypothenemus peritus, sp. n.

Oblongus, subnitidus, fusco-piceus, prothorace in medio dilutiore, semi-ovato, antrorsum angustato, margine antico tuberculis 4, duobus mediis majoribus, ornato, anterius tuberculis magnis discretis notato, postice rugulose punctato; elytris ad apicem subacuminatim rotundatis, subtiliter lineato-punctatis et setosis, interstitiis uniseriatim squamulatis. Long. 1·8 mm.

One specimen, Nagasaki.

Oblong, rather shining, deep fuscous, with surface of prothorax lighter in middle. Head finely reticulate, front subconvex, punctured in middle. Antennæ sordid testaceous, funiculus 5-jointed, suture of club distinctly fringed. Prothorax very slightly broader than long, base subsinuate, basal angles obtusely rounded, sides slightly dilated before base and rounded, contracted towards apex and obscurely sinuate, apical margin with four tubercles in the middle, the two centre ones more prominent; surface obtusely gibbous in middle, with thin covering of hairs and scales, anteriorly with a roundish patch of large scattered tubercles, becoming closer and smaller behind, interstices and base finely reticulate with scattered punctures, except over a narrow smooth line from base to middle. Elytra rather more than half as long again as prothorax, separately rounded at base, humeral angles rounded, sides parallel to posterior third, thence obliquely rounded to apex; surface subcylindrical, obliquely declivous and convex at apex, with fine lines of punctures bearing minute hairs, the lines appearing impressed in certain light, interstices transversely rugose, with a single row of cinereous scales along middle and a few hairs on either side. Legs infuscate with anterior femora and tarsi lighter.

Quite like *H. tristis*, Eichh., but differing from the type

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in the fewer and stronger tubercles of the prothorax, the more scattered punctuation of its base, which presents a smooth central line, and the finer elytral striæ, which in *H. tristis* are strong and well-marked. It is also rather more elongate.

Hypothenemus expers, sp. n.

Oblongus, subnitidus, piceo-niger, prothorace medio dilutiore, subrotundato, ante basim dilatato, margine antico bituberculato, dorso anterius tuberculis discretis in plaga rotundata compositis notato, posterius granulato; elytris lineato-punctatis, pilosis, interstitiis setis haud squamatis seriatis ornatis. Long. vix 2 mm.

Two examples, Kumamoto and Nagasaki.

Closely allied to *H. peritus*, but exhibiting the following differences :—

Rather larger and more robust, darker in colour, being black with a pitchy tinge, the thorax pitchy-red in middle, and not obscurely testaceous. Front of head more convex, very finely reticulate and not punctured except over mouth, where it is transversely impressed. Antennæ bright testaceous, basal joint of club deeply infuscate, funiculus 5-jointed. Prothorax more strongly dilated before base, which is truncate, sides more strongly rounded, its tuberculation similar, but marginal tubercles less prominent, the two outer ones nearly obsolete, basal half closely reticulate and covered with small asperate elevations, closer than the non-elevated punctures in *H. peritus*. Elytra narrower than greatest width of prothorax, truncate at base, obliquely rounded at apex, striation as in *H. peritus*; interstices without evident scales, but with a single row of erect hairs, which are stronger towards apex, a few finer hairs are found between the rows. Legs clear testaceous.

The absence of the conspicuous erect hispid scales on the elytra, which are replaced by hairs, will at once distinguish this species from either of the two former.

Cosmoderes, Eichh.

This genus was founded by Eichhoff, Rat. Tom., p. 495, for *C. monilicollis*, a single species from India, which differs from *Hypothenemus* (*Stephanoderes*, Eichh.) in possessing a very short two-articulate antennal funiculus and dilated tibiæ with their outer borders serrate, the serration being absent in *Hypothenemus*; the typical species is also more elongate than a *Hypothenemus*, and

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differs in colour, and the sculpture of the elytra, which have large dilated punctures and subcostate interstices, so that they appear reticulate. There is in Mr. Lewis's Ceylon collection a specimen which corresponds in every respect to Eichhoff's description of *C. monilicollis*, and is almost certainly that insect. In the Japanese collection is a specimen which agrees with it in generic characters, but is much more closely allied in appearance to *Hypothenemus*, showing the near relationship between the genera, which are, however, sufficiently distinct.

Cosmoderes consobrinus, sp. n.

Oblongus, subcylindricus, opacus, niger, elytris nigro-piceis, antennarum scapo tarsisque testaceis; prothorace aeque longo quam lato versus apicem subangustato, apice rotundato, bituberculato, disco gibboso, anterius exasperato, posterius scabrose granulato; elytris prothorace duplo longioribus, seriatim pilosis et striatis, striis leniter impressis, vix perspicue punctatis, interstitiis alutaceis uniseriatim squamosis. Long. 2 mm.

One example, without locality.

Oblong, rather elongate, cylindrical, black, with elytra obscurely piceous. Head finely reticulate, front convex, finely and sparingly punctured, and very shortly pubescent, eyes oval emarginate: antennæ testaceous with club infuscate, short oval, pubescent with a smooth patch at base, without evident sutures. Prothorax as broad as long, contracted at sides towards apex, base truncate not margined, basal angles obtuse, sides slightly rounded behind, subsinuate and more rounded anteriorly, apical margin strongly rounded with two prominent median tubercles; surface convex and gibbous in middle, obliquely impressed on either side behind median elevation, in front strongly declivous and rather finely asperate, base and interstices dull, covered with fine scabrous projections, pubescence very short. Scutellum distinct, triangular. Elytra a little wider than base of prothorax and double as long, base truncate, humeral angles rounded rectangular, shoulders rather prominently elevated, sides subparallel, obliquely rounded at apex; surface subcylindrical, very obliquely declivous towards apex, its texture coriaceous, with shallow impressed striæ, with barely distinguishable punctures and rows of minute hairs, interstices alutaceous, subconvex, with a single series of erect narrow

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scales. Legs fusco-piceous with tarsi lighter, outer border of middle tibiæ distinctly serrate.

This insect is very like *Hypothenemus tristis* and *peritus*, but is more elongate; the base of the thorax and the elytra are differently sculptured, and the structure of the antennæ and legs will at once separate it without comparison.

Pityophthorus, Eichh.

But one species has yet been found in Japan. It is likely that there are others as, in addition to the European species, there are several from both N. and S. America.

Pityophthorus jucundus, sp. n.

Elongatus, oblongus, nitidus, fere glaber, niger vel fusco-testaceus; prothorace antice subconstricto, post medium utrinque impresso, anterius exasperato, posterius fortiter punctato, linea media subelevata laevi; elytris cylindricis, haud acuminatis, regulariter punctato-striatis, striis non impressis, interstitiis fere planis hic illinc subrugulosis, apice impresso-retuso, striis obsoletis, lateribus elevatis et sutura versus apicem tuberculis setigeris raris ornatis. Long. 1·6 mm.

Fem. Fronte media villosa.

Four specimens, near Nagasaki.

Head black, finely reticulate, front strongly punctured, with a circular patch of villous pubescence in female. Antennæ fusco-testaceous, their club ovate, tri-articulate with slightly curved sutures. Prothorax with base finely margined, truncate, basal angles obtuse, sides behind nearly straight, rounded in front and sinuate before apex, which is somewhat obtusely rounded, and feebly crenate, the apical constriction much slighter than in *P. lichtensteini*, Ratz; surface depressed on either side of a median smooth elevated line, reaching to the middle of the prothorax, with very short pubescence at sides and apex, its anterior half asperate, posterior half with rather strong subrugose punctures becoming weaker on sides. Elytra rather narrower at base than prothorax, and nearly twice as long, sides straight to middle then feebly rounded, apex obtusely rounded, not acuminate but with suture slightly prominent; glabrous except at apex, with regular lines of strong punctures, not impressed, interstices impunctate and flat, feebly rugose here and there, apex nearly vertically declivous,

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impressed on either side of suture, the impression shining, impunctate, its outer margins more strongly elevated than suture, with two or three weak setigerous tubercles; suture very slightly elevated, with traces of tuberculation near apex; underside black, thinly pubescent. Legs fuscous.

A slender narrow species, readily distinguished by the strong punctures of the thorax, with its elevated median smooth line, by the distinct and regular rows of punctures on the elytra, which are nearly glabrous and not acuminate.

Eidophelus, Eichh.

I add one more species provisionally to this genus.

Eidophelus imitans, Eichh.

Eichh., Scol. Jap., p. 200; Rat. Tom., p. 203.

One example, very small, has occurred since, without recorded locality.

Eidophelus minutus, sp. n.

Oblongus, nitidus, piceo-niger, fere glaber; prothorace latitudine vix longiore, lateribus ad medium subrectis, inde cum apice subcirculare rotundatis, supra convexo, antice lineis tuberculorum concentricis exasperato, postice punctis discretis fortibus, in medio subtilioribus notato; elytris ad apicem oblique declivibus, non impressis, lineato-punctatis, punctis post medium obsoletis, interstitiis subrugosis absque punctis. Long. 1·2 mm.

One example, Chiuzenji.

Oblong, piceous-black, with a few hairs on elytra and sides of thorax. Head reticulate, front strongly punctured, scantily hairy; eyes oval, scarcely visibly emarginate; antennæ testaceous, funiculus 4-jointed, club orbicular oval with weak curved sutures, pubescent at apex. Prothorax little longer than broad, base truncate, finely margined, basal angles obtuse but distinct, margined, sides straight, slightly narrowed towards middle, then subcircularly rounded, apex slightly flatter; its anterior half with about six concentric rows of fused tubercles, forming a series of raised lines somewhat as in *Cryphalus tiliæ*, the anterior row occupying the apical margin when seen from above, posterior half with very scattered punctures, strong at sides, smaller and somewhat asperate on middle Scutellum triangular, shining. Elytra rather

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narrower than prothorax, and half as long again ; base truncate, its angles obtuse, sides weakly rounded to middle and subdilated, thence more strongly rounded to apex; surface with rows of rather small punctures, separately impressed and not striate, becoming weaker from base and nearly obsolete on declivity ; interstices slightly rugose, with one or two punctures at base ; apex obliquely declivous, convex and not impressed, with traces of one or two asymmetrical tubercles near suture. Underside piceous, scantily pubescent. Legs infuscate.

This insect agrees with *E. imitans* in its antennal structure, but is separable by the absence of distinct pubescence and the sparseness of the punctures on the hinder half of the thorax. The entire absence of any thoracic constriction and the antennal structure will distinguish it from the *Pityophthori*.

Tomicus, Latr. (1807).

The Japanese fauna appears to be poor in this genus; perhaps other species remain to be discovered.

Tomicus cembrae, Heer.

Bostrichus cembrae, Heer, Obs. Ent. 1836, p. 28.

A series taken from larch on Fujisan.

The specimens show no essential difference from European examples. Like the Japanese *Myelophilus piniperda*, they run very large, averaging 5·5 mm. The interstitial punctures of the elytra are very weak, but traceable. *T. cembrae* is recorded from Siberia and Amurland and no doubt occurs over the whole of N. Asia; in Europe it is confined to *Pinus cembra*, which is found in Japan, at least, as the variety *pumilus*. I cannot find any Japanese specimens which correspond with Motschulsky's *T. subelongatus*.

Tomicus angulatus, Eichh.

Eichh., Scol. Jap., p. 200; Rat. Tom., p. 258.

Taken commonly in several localities from fir (*Pinus massomana*); Nagasaki, Fujisan, Nikko.

Acanthotomicus, nov. gen.

Antennarum funiculus 5-articulatus, articulis 2—5 latitudine crescentibus, clava ovalis, compressa, suturis fere obsoletis fortiter

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curvatis articulo 1o ovali, ceteris lunatis. Prosternum processu nullo. Episterna metathoracica linearia. Tibiæ anticæ ad apicem dilatatæ, spinosæ. Corpus cylindricum, elytris ad apicem retusis, ambitu retusionis fortiter multi-spinato, stria suturali vix impressa.

Closely allied to *Tomicus* but differing in the much stronger elytral armature, which in *Tomicus* exhibits a uniformly progressive diminution, as the species grow smaller, down to the genus or subgenus *Pityogenes*, Bedel. The antennal club is oval, its sutures are quite superficial and only marked by a pubescent border, the first joint is longitudinally oval and embraced at the sides by the succeeding joint, as in *Xylocleptes*, Ferrari, with which the elytral structure has no affinity. The mouth parts do not differ from these of *Tomicus*, the maxilla is simply sinuate internally, and not produced into a rounded angle, but this angle is wanting in *Pityogenes* and is not a generic character.

Acanthotomicus spinosus, sp. n.

Oblongus, cylindricus, nitidus, ferrugineo-testaceus, elytris ad apicem infuscatis, pilis longis parce adspersus; prothorace antice constricto, ad medium subgibboso et utrinque impresso, anterius exasperato, posterius subtiliter punctulato; elytris prothorace dimidio longioribus, punctato-striatis, punctis ad basin subtilibus, versus apicem dilatatis, ad apicem abrupte declivibus, utrinque 8-spinatis, spinula 3a maxima, elongata, 5a—7a minimis, 8a prope angulum suturalem magna, intus curvata. Long. 2·5 mm.

Two specimens taken at Oyayama and Nikko.

Oblong, cylindrical, reddish-testaceous, with apex of elytra infuscate. Head with front subconvex, punctured, with a median raised line, thinly pubescent; eyes broad oval, slightly emarginate. Prothorax longer than broad, its base truncate, basal angles obtuse, sides almost parallel to middle, then constricted and strongly rounded to apex, which is somewhat more obtuse, with a crenate margin; disc gibbous in middle and impressed on either side, asperate anteriorly behind with fine scattered punctures without a median impunctate or elevated line. Scutellum small, rounded, elytra half as long again as prothorax, their base truncate, sides subparallel, with lines of punctures, fine at base, becoming stronger, dilated and transversely rugose towards apex, the striæ appearing impressed towards apex in a certain light only, interstices

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slightly convex, very finely and sparingly punctured in rows; apex nearly vertically declivous, margined with 16 spines at the apex of the 2nd and succeeding interstices, the 1st two short, 3rd very long, curved, 4th and 5th rather shorter, 6th and 7th small, 8th pair situated close to apex of suture, curved inwards and as long as fourth. Impressed surface rather dull, irregular, strongly punctured, with suture elevated. Underside testaceous, glabrous. Antennæ and legs testaceous.

The following specimen is probably the female of the preceding insect, but I cannot be positive.

Acanthotomicus spinosus, ? *femina*.

Antecedenti differt fronte plana utrinque densissime aureo-villosa, prothorace paullo longiore, minus constricto, margine antico fortius rotundato, haud crenato, dense villoso; elytris pro portione elongatis, prothorace duplo fere longioribus, punctis striarum paullo fortioribus et magis confertis, ad apicem singulatim breviter 6-spinosis, infra prope angulum suturalem in lobum brevem 4-tuberculatum productis; fundo retusionis punctis minoribus, confertis, et spinula intra spinam tertiam marginalem posita utrinque ornato. Long. 3 mm.

One example taken at Kashiwagi.

In the dense villosity of the head and prothorax, and the reduction in size of the apical spines of the elytra, its characters may be considered as simply sexual. But the greater length of the elytra and the closer and stronger punctuation of the striæ, the sutural stria being impressed at the apex, together with the presence of a spine on the apical declivity internal to the 3rd marginal spine, prevent my identifying it positively as the female. The apical spines are all short, the 3rd and 5th being the most prominent; the lower border is produced on either side just outside the suture, into a short transverse lobe, which is evidently 4-tuberculate and represents the three inferior spines fused.

DRYOCŒTES, Eichh.

This genus, in which I include Eichhoff's *Taphrorychus apatoides* and two allied species, is represented by eight species, of which six are new.

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TABLE OF SPECIES.

1. Prothorax gradually and uniformly rounded from base to apex 2
   cylindrical at base with apex obliquely declivous (*Taphrorychus*, Eichh.) 6
2. Apex of elytra retuse, impressed or flattened (size 2·5—4 mm) 3
   convex (size under 2·5 mm.) 5
3. Front of head not carinate 4
   with a sharp longitudinal carina . . . *affinis*.
4. Striæ of elytra finely and uniformly punctured, *autographus*, Ratz.
   coarsely punctured, punctures dilated behind base . . . . . *pilosus*.
5. Elytra with strongly punctured striæ . . . . . *luteus*.
   rows of feeble punctures . . . . . *nubilus*.
6. Prothorax rounded at apex . . . . . *moestus*.
   subquadrate, the apex obtuse, forming an angle with sides 7
7. Interstices of elytra not elevated towards apex . *dinoderoides*.
   sub-costate towards apex, *apatoides*, Eichh.

Dryocœtes autographus, Ratz.

Ratz., Forst. Ins., i., p. 160.
Eichh., Berl. Ent. Zeit., 1864, p. 39 ; Rat. Tom., p. 281.

Two examples, Chiuzenji.

The elytra are almost hairless in these specimens and very evidently retuse at apex, with the interstitial punctures almost obsolete; but they are quite like German specimens in my collection. The species, which extends throughout N. Asia and the colder parts of N. America, is of variable form.

Dryocœtes pilosus, sp. n.

Oblongus, subnitidus, longe pilosus, piceo-niger, antennis pedibusque ferrugineis, fronte plana haud carinata ; prothorace dense granulato exasperato ; elytris prothorace dimidio longioribus, transverse rugosis, fortiter punctato-striatis, punctis postice subtilioribus, stria suturali subimpressa, interstitiis subtiliter uniseriatim punctatis, apice retuso impresso, striis fere obsoletis, pilis longis circumdato. Long. 3 mm.

One example, Nikko.

Oblong, pitchy-black, head with front flat, dull, finely punctured, and with a faint transverse impression at sides, with long scattered hairs, mouth fringed. Prothorax a trifle broader than long, base

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truncate, humeral angles obtusely rounded, sides and apex rounded in a broad ellipse; surface very convex, with uniform scattered granulations, their interspaces shining, fringed at margins with long scanty hairs. Scutellum small, rounded, convex, shining. Elytra narrower than greatest width of thorax, and half as long again; base truncate, humeral angles obtusely rounded, shoulders narrowly raised, sides subsinuate, slightly dilated behind and strongly rounded at apex; surface subcylindrical, depressed before middle, dilated posteriorly and strongly declivous at apex, with rows of strong punctures, the punctures dilated on middle third and then becoming finer, sutural stria slightly impressed, interstices subconvex, transversely rugose, with a single series of fine setigerous punctures; apical declivity convex, impressed on either side of suture, shining, with striæ obsolescent; elytra set with long hairs, close at sides and at margins of apical declivity, hairs of declivity itself shorter. Underside piceous, punctured; abdomen with long pubescence. Legs ferruginous.

Readily distinguished by the long pubescence, the absence of a frontal carina, the strong punctuation of the elytral striæ, and the punctured interstices.

Dryocœtes affinis, sp. n.

Oblongus, niger, subnitidus, pilosus; fronte carinata; prothorace vix longiore quam latiore, granulate exasperato, postice paullo subtilius; elytris prothorace minus quam sesqui longioribus, cylindricis, apice oblique declivi subretuso, subtiliter lineato-punctatis, stria suturali impressa, interstitiis subrugosis seriatim pilosis. Long. 3 mm.

A single example, Oyayama.

Black, elytra with a piceous tinge. Head with front impressed and longitudinally carinate, coarsely punctured and thinly hairy, ciliate over middle of mouth. Prothorax a little longer than broad, truncate at base with angles obtuse, sides feebly rounded behind and very slightly dilated to posterior third, strongly and uniformly rounded in front to apex, the margin of which is tuberculate; surface uniformly convex, asperate, rather more finely at base, with scattered hairs. Scutellum small, rounded, shining, finely bordered. Elytra rather wider than base of prothorax and about one-fourth longer, truncate at base with shoulders narrowly elevated, humeral angles rounded rectangular, sides rounded and somewhat narrowed at posterior fourth, then rather abruptly flexed, and nearly straight at apex, which is not conjointly

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rounded; surface subcylindrical, obliquely declivous behind, with rows of shallow punctures, their interspaces rugose, sutural stria alone slightly impressed, interstices rather narrow with series of setigerous tubercles; apex flattened, shining, impressed on either side of suture with the striæ continued on it; first interstice widened. Underside piceous-black, nearly glabrous, first abdominal segment impunctate in middle, succeeding segments with a few very coarse punctures. Legs piceous, anterior tibiæ rounded, with six or seven outwardly directed spines on outer margin, and a curved one at inner angle of apex; middle tibiæ with a close series of six forwardly directed spines at apex.

In sculpture this insect is exactly like the one I have identified as *Coccotrypes graniceps*, Eichh. (*q.v.*), but may be distinguished by its cylindrical shape and the structure of the tibiæ.

Dryocœtes luteus, sp. n.

Oblongus, subnitidus, flavo-testaceus, parce et breviter pilosus; prothorace oblongo, lateribus postice subparallelis, antice fortiter rotundatis, anterius subtiliter exasperato, posterius dense punctato; elytris profunde striato-punctatis, stria suturali impressa, interstitiis subtiliter uniseriatim punctatis in declivitate tuberculatis. Long. 2 mm.

Fem. Fronte densius pilosa.

Nine specimens, without locality indicated.

Bright yellow-testaceous, with short scanty pubescence on sides of thorax and apex only of elytra. Head strongly punctured, with front convex, scantily hairy in male, and ciliate over mouth; in female° with a circular tuft of yellow pubescence. Eyes broad oval, coarsely granulate, and emarginate anteriorly. Antennæ testaceous with sutures slightly curved. Prothorax longer than broad, with base truncate, its angles obtuse, sides nearly parallel to middle, thence strongly rounded to apex; above moderately convex, not gibbous, with close punctures, simple at base, and asperate over anterior two-thirds. Scutellum rounded, shining. Elytra as wide as prothorax and one-half longer, base truncate, humeral angles rectangular, sides parallel to apex, then abruptly flexed, their apical margin being almost transverse when seen from above;

° It would appear that in the *Tomici* the possession of a villous front is a mark of the female sex, see Eichh., Eur. Bork., p. 203. It is not so in the genus *Scolytus*, and others.

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surface cylindrical, nearly vertically declivous at apex, but convex, with regular impressed rows of strong punctures dilated after the base, sutural stria more deeply impressed and widened behind, interstices flat with a single row of fine punctures, replaced by small setigerous tubercles on declivity. Underside and legs testaceous, the former scantily punctured and pubescent.

Similar to immature examples of *D. villosus*, Fabr., but twice as small, with the prothorax not asperate behind, with scantier pubescence, and the elytral interstices more distinctly defined.

Dryocœtes nubilus, sp. n.

Oblongus, subnitidus, parce longius pilosus, piceo-niger, antennis pedibusque testaceis; prothorace oblongo-ovali anterius rugulis transversis exasperato, posterius subnitido, rugulose punctato; elytris ad apicem oblique declivibus, subtiliter lineato-punctatis, stria suturali non aut vix impressa, interstitiis post medium uniseriatim pilosis. Long. 1·7—2·2 mm.

Ten specimens, Kiga, Suyama.

Oblong, lighter, or darker piceous-brown. Front of head scantily punctured, weakly impressed at sides, and with a median subelevated longitudinal line, its pubescence long and thin, mouth ciliate; antennæ testaceous, with sutures of club straight. Prothorax a little longer than broad, its base truncate, basal angles obtusely rounded, sides rounded, slightly behind, more strongly towards apex; surface somewhat depressed, asperate in front with concentric lines of transverse tubercles, becoming weaker behind and replaced at base by rugose punctures, except over an indistinct median smooth line; sides and apex with long scanty hairs. Scutellum rather large, rounded, shining. Elytra rather wider than prothorax at base, and one half longer, truncate at base, with shoulders nearly rectangular, sides parallel to near apex, then gradually rounded; apex not obtuse; surface cylindrical, obliquely and convexly declivous for posterior third, with rows of fine punctures, the sutural stria alone with a trace of impression in some specimens; interstices subrugose, with a single row of finer setigerous punctures, the setæ becoming longer and more conspicuous towards apex. Underside testaceous-brown, nearly glabrous and impunctate. Legs reddish testaceous.

Distinguishable from *D. alni*, Georg., by its smaller size, the weaker punctuation of the base of the thorax and elytra, and the absence of the lateral impressions and

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elevated suture of the apical declivity. I can see no sexual characters, but one example is more elongate, with the thorax more distinctly narrowed behind, and the median line subelevated. No specimens measure less than 2 mm., except one, which is very small (1·7 mm.), with the head finely punctured, and without long pubescence. It may be distinct, but I can find no characters by which it may be separated.

The three following species differ somewhat in *facies* from *Dryocœtes* proper, but it is not possible to construct a new genus for them without dissection, for which more material is required. They can be distinguished by the shape of the prothorax, which is not uniformly curved from base to apex, but is cylindrical at base and declivous anteriorly, so as to form an obtuse median elevation. Its anterior half is markedly scabrous, while the hinder part is smooth; but a uniform sculpture of the prothorax does not occur in all the species of *Dryocœtes*. Eichhoff described one originally as a *Dryocœtes*, but afterwards included it, doubtfully, in the genus *Taphrorychus*. I cannot, however, see adequate grounds for this, and prefer to keep it at present in *Dryocœtes*, with which the other two species form a connecting link.

Dryocœtes mœstus, sp. n.

Oblongus, cylindricus, subnitidus, pilosus, niger, antennis pedibusque testaceis; prothorace aeque lato quam longo, apice rotundato, tuberculato, supra transverse subgibboso, antice exasperato, postice rugose punctato, linea media obsolete elevata; elytris lineato-punctatis, stria suturali subimpressa, interstitiis uniseriatim subtiliter punctatis et pilosis, ad apicem fortiter declivibus, declivitate deplanata, nitida, ad suturam utrinque impressa. Long. 2·6 mm.

A single specimen, Nikko.

Black, cylindrical; head with front convex, thinly pubescent, punctured, with an indistinct elevated longitudinal line; antennæ testaceous, club with sutures curved, pilose, basal joint shining, equal in length to succeeding joints, apical joint sensitive, pubescent. Prothorax with length and breadth equal, base truncate, basal angles nearly rectangular, sides feebly rounded to near apex, then abruptly and broadly rounded, apical margin tuberculate; surface cylindrical at base, declivous at apex, with an indistinct

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transverse elevation in middle and an impression behind it on either side of a median longitudinal raised line, somewhat shining in middle of base only, anteriorly with transverse rugosities, strong near apex, and gradually replaced over base by rugose punctures; pubescence short, rather close. Scutellum triangular, shining. Elytra as wide as prothorax and less than twice as long, base truncate, humeral angles rounded, sides subparallel to near apex, which is rather abruptly and obtusely rounded; surface moderately shining, with rows of shallow punctures which appear impressed in certain lights only, sutural stria rather more strongly impressed, interstices somewhat convex, subrugose, with a single row of fine setigerous punctures, the setæ longer and conspicuous towards apex, which is strongly but not abruptly declivous, more shining and flattened, with an impression on either side of the suture, its striæ nearly obliterated, interstices finely tuberculate. Underside black, nearly impunctate, with thin pubescence. Legs reddish testaceous, anterior tibiæ straight, dilated and obliquely rounded at apex, with five or six spines, besides a longer spine at inner angle; middle and posterior tibiæ with outer border curved and serrate.

Dryocœtes dinoderoides, sp. n.

Oblongus, cylindricus, subnitidus, pilosus, niger, antennis pedibusque testaceis; prothorace quadrato, apice fere truncato, supra elevato subgibboso, antice exasperato, postice rugose punctato, linea media laevi; elytris lineato-punctatis, stria suturali quam minime impresso, interstitiis uniseriatim subtiliter punctatis et pilosis, apice convexe declivi, haud impresso. Long. 2·5 mm.

One specimen, Ichiuchi.

Very like the last species and probably the male; but I cannot unite them without further evidence. It differs in the prothorax, which is very obtusely convex at apex, so as to present an evident angle between the sides and anterior margin, as in the next species; the anterior border is not crenate, the tubercles are less numerous and stronger before the median elevation, and the base less closely punctured. The elytral striæ do not appear impressed in any light, with the exception of the first, the apex is not flattened or impressed along the suture, and the pubescence is finer though equally dense. The head, antennæ, and legs are similar.

These two preceding species are easily distinguished from *D. apatoides* by the interstices not being costate towards the apex of the elytra.

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Dryocœtes apatoides, Eichh.

Dryocœtes (?) *apatoides*, Eichh., Scol. Jap., p. 201.
Taphrorychus (?) *apatoides*, Eichh., Rat. Tom., p. 209.

No further example has occurred.

The legs of this insect are piceous-black, not ferruginous as described by Eichhoff. They are rather more slender than in the two last insects, and, therefore, more like those of a *Taphrorychus*, but there is no real difference in their structure. If the two last species are sexes of the same, the form of the prothorax in this insect is probably sexual.

Coccotrypes, Eichh.

The species of this genus are closely allied to *Dryocœtes*, Eichh., and though differing in the maxillary armature and in habits, are not always easily separable. The prosternal characters seem to me to be of little value, and the basal border of the prothorax, which is absent in *Dryocœtes*, is not always readily distinguishable in this genus. They can be differentiated without dissection by their shape, which (in the Japanese species) is shorter and more ovate, and by the tibiæ, which are distinctly truncate, and not grooved for the tarsi; whereas in *Dryocœtes*, the anterior tibiæ at least have the outer margin rounded to the inner angle of the apex, without abrupt change of direction, and are recessed.

I add two species.

Coccotrypes graniceps, Eichh.

Eichh., Rat. Tom., p. 314.
Dryocœtes graniceps, Lewis, Cat. Jap. Col.

One example, Nagasaki; also at Hiogo (*von Schönfeldt*).

I have not seen the type, which is not in Mr. Lewis's collection, but the specimen corresponds absolutely to Eichhoff's description, except that the whole surface is uniform pitchy-brown. Legs ferruginous, the anterior tibiæ with border simple for basal half, then with two outwardly directed spines, apex with two forwardly directed spines, besides spine at inner angle; intermediate tibiæ with three forwardly directed spines at apex. Punctuation of abdomen finer than in *Dryocœtes affinis*.

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Coccotrypes perditor, sp. n.

Ovalis, subnitidus, ferrugineus, pilosus ; prothorace haud transverso, ad apicem subangustato, margine antico tuberculato, anterius tuberculis concentricis vix transversis, posterius longitudinalibus ornato ; elytris lineato-punctatis, punctis setis adpressis, interstitiis setis longioribus erectis ornatis. Long. 1·5 mm.

Five specimens, in the neighbourhood of Nagasaki.

Oval, convex, lighter or darker ferruginous-brown ; head punctured, with rather long pubescence at sides and over mouth ; front elevated at sides and impressed in middle, with a fine median raised line. Prothorax scarcely broader than long, semi-elliptical, narrowed towards apex, and not evidently contracted at base, which is truncate, with the posterior angles nearly rectangular, sides feebly rounded to middle, thence gradually more strongly and subsinuate to apex, the margin of which is crenate, with a series of fine tubercles ; surface rather strongly and uniformly convex, moderately shining, with scattered small asperations forming indistinct concentric lines in front and longitudinal elevations over the base. Scutellum small, punctiform, piceous. Elytra a little wider than base of prothorax and one-fourth longer, truncate at base with humeral angles rectangular, sides subparallel and straight for basal third, then gradually rounded to apex ; above convex, and rounded from base to apex with rows of shallow setigerous punctures, their setæ short, interstices narrow and flat, with a single series of less frequent fine aciculations bearing long erect setæ. Legs ferruginous or testaceous.

Easily distinguished from *C. graniceps* by its much smaller size, and the absence of an apical impression on the elytra. Allied to *C. pygmæus*, Eichh., and, therefore, to *C. integer*, Eichh., from Siam, which latter I have not seen. Shorter and more ovate than *C. pygmæus* ; the thorax rounder at the sides, and more convex, more shining, with far fewer asperities. Elytra less than one-sixth longer than broad (in *C. pygmæus* they are at least one-third longer, and appear comparatively cylindrical) ; their striæ more distinctly and sparsely punctured, and wider apart, the interspaces with fewer and smaller setigerous tubercles ; striæ continued on to the apex and not obliterated, as in *C. integer*.

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Coccotrypes advena, sp. n.

Oblongo-ovalis, nitidus, pilosus, piceo-ferrugineus, antennis pedibusque dilutioribus; prothorace antice contracto, angulis posticis obtusis, lateribus rotundatis, apice nonnihil deplanato, mutico, supra minus convexo, punctis haud frequentibus aciculatis notato: elytris fortius lineato-punctatis, punctis haud setigeris, interstitiis uniseriatim setosis. Long. 1·6 mm.

One example near Nagasaki.

Oblong oval, ferruginous-brown, with long pubescence. Front coarsely punctured, flattened and impressed over mouth. Prothorax contracted in front, as long as broad, basal angles obtusely rounded and not applied to humeral angles of elytra, sides and apex separately and not strongly rounded; surface only feebly convex, shining, with long hairs, arising from scattered aciculate punctures, which are weaker on the disc around an indistinct median impunctate line. Scutellum rounded, piceous, shining. Elytra wider than base of prothorax, and more than one-third longer, humeral angles subrectangular, sides parallel to middle, thence obliquely rounded to apex; surface subcylindrical for basal third, then dilated and convexly declivous, with rows of punctures, strong and dilated at base, weak and shallow, but not obsolete, towards apex, without seriate hairs, interstices with a single row of fine aciculations bearing erect setæ. Legs ferruginous.

Readily confounded with *C. perditor*, but more elongate; the prothorax much less convex, with the apex and sides not conjointly rounded, and the posterior angles obtuse and not applied to the elytra, not tuberculate, the punctures being scattered and only slightly elevated; punctures of the elytral striæ much stronger at base and without setæ. The shape of the prothorax, which is hardly more convex than that of most *Dryocœtes*, and its sculpture will distinguish it from other species of *Coccotrypes*. I have not been able to dissect it, but the generic characters, as far as observable, agree with this genus.

Xyleborus, Eichh.

This genus is very well represented in Japan by 29 species, exclusive of three males, which I have described

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separately, as there is nothing to show to what species they belong. This is more than one-fourth of the genus as at present known, but only a small proportion of the species existing in collections have been described. Eichhoff in his "Ratio Tomicinorum" groups the species by the shape of the prothorax, and thereby obtains a satisfactory result. I have found his table of species easy to work with, but cannot adopt it for the Japanese forms, as in certain species, *e.g.*, *X. validus*, *praevius*, *seriatus*, the form of the prothorax is either ambiguous, and could be used to place the species in more than one of Eichhoff's sections, or is of a shape that would dissociate the insect from its allies. Some previous familiarity with the forms met with in the genus is necessary in order to locate these doubtful species. I have, therefore, in drawing up a table, laid less stress on this character, and have aimed simply at differentiating the species rather than arranging them in a natural sequence. The three species of males referred to are not included in it; their characters will be found on page 119.

TABLE OF SPECIES.

1. Elytra confusedly punctured, not in evident rows 2
   with distinct rows of punctures 5
2. Form elongate, prothorax longer than broad, *pelliculosus*, Eichh.
   short, prothorax not longer than broad 3
3. Elytra abruptly truncate at apex, black. 4
   gradually declivous at apex, ferruginous,
   semi-opacus, Eichh.
4. Prothorax with two tubercles in middle of apical margin,
   mutilatus.
   without tubercles on apical margin . *brevis*, Eichh.
5. Prothorax entirely dull, uniformly and closely asperate . . 6
   with posterior half more or less shining, punctured 7
6. Interstices of elytra with irregular double rows of punctures,
   lewisi.
   with single rows . . . *rubricollis*, Eichh.
7. Prothorax subglobose, not longer than broad, or subrectangular with sides and apex separately rounded; declivity usually carinate below . 8
   oblong, cylindrical, with apex strongly rounded; if not longer than broad, declivity of elytra not carinate below 16

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8. Declivity very oblique, beginning abruptly before middle of elytra, opaque and squamous . . . . . *concisus*.
not abrupt, nor squamous 9
9. Interstices with irregular double rows of punctures . *apicalis*.
with a single row of punctures 10
10. Basal half of prothorax strongly punctured, covered with short erect hairs . *atratus*, Eichh.
not strongly punctured, nor uniformly hairy 11
11. Base of prothorax with a patch of hair before scutellum, species short, small 12
glabrous, species larger, elongate . . . 13
12. Hairs at apex of elytra arising from interstices only, *germanus*.
from both striæ and interstices . . *compactus*, Eichh.
13. First interstice of elytra tuberculate at apex 14
not tuberculate at apex, *obliquecauda*, Motsch.
14. Elytral striæ not impressed at apex, tuberculation of interstices weak . . . . . *prævius*.
impressed, tuberculation of interstices strong 15
15. Prothorax narrowed towards apex . . . . *validus*, Eichh.
uniformly rounded at sides, not narrowed, *aquilus*.
16. Apical border of elytra rounded, declivity not excavate . . 17
truncate or emarginate, declivity sulcate or concave. 25
17. Declivity of elytra sharply carinate below 18
obtusely margined, not carinate . . . 20
18. Prothorax scarcely broader than long, elevated in middle of surface, distinctly punctured at base, *festivus*, Eichh.
Prothorax at least one-half broader than long, elevated before middle, base feebly punctured 19
19. Entirely piceous black, apex of elytra abruptly declivous, *glabratus*, Eichh.
Prothorax ferruginous, elytra infuscate, gradually declivous at apex . . . . . *bicolor*.
20. Body narrowed behind from front of prothorax, *attenuatus* and *sobrinus*, Eichh.
cylindrical 21
21. All interstices with traces of tuberculation on apical declivity 22
First and third interstices tuberculate on declivity, second unarmed 23

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All interstices tuberculate above declivity, which is impressed and unarmed (length less than 2 mm.), *minutus*.

22. Prothorax as broad as long, elytra with alternate series of longer and shorter hairs . . . . . *seriatus*.
longer than broad, hairs of elytra uniform, *muticus*.

23. Piceous with thorax sometimes lighter. . . . . *adumbratus*.
Ferruginous or testaceous 24

24. Elytra rather strongly striato-punctate . . . *badius*, Eichh.
finely punctured in rows . . . . . *vicarius*, Eichh.

25. Declivity with a narrow sulcate impression along suture, each lateral margin with four or five small tubercles . . . . . *schaufussi*.
widely impressed, each lateral margin with two strong spines 26

26. Ferruginous brown, apical depression nearly vertical, feebly emarginate below . . . . . *defensus*.
Black, apical depression very oblique, strongly emarginate below . . . . . *exesus*.

Xyleborus mutilatus, sp. n.

Fem. Curta, subnitida, fusco-pilosa, nigra, antennis pedibusque ferrugineis; prothorace magno globoso, lateribus leniter, apice fortiter rotundato et tuberculis duobus ornato, supra in medio transverse elevato et postice utrinque impresso, anterius exasperato, posterius dense punctato, supra scutellum hirto; elytris prothorace brevioribus, a basi fere oblique et abrupte declivibus, supra irregulariter punctatis, declivitate striata, interstitiis granulatis, lateribus et apice infra marginatis. Long. 3·5 mm.

One example, without locality.

Black, with the base of the elytra alone shining, covered with fine erect fuscous hairs. Head large, prominent, finely reticulate, front convex, punctured, and hairy; mouth ciliate with yellow pubescence; eyes small, flat, finely emarginate; antennæ ferruginous, club round, basal joint large, shining, reaching nearly to apex of club. Prothorax a little longer than broad, its base bisinuate, produced behind, basal angles nearly rectangular, sides straight and subparallel behind, becoming more rounded in front with apex broadly convex, apical margin bisinuate, slightly produced in middle and armed with two prominent tubercles; surface very convex, cylindrical at base, with an obtuse transverse elevation in middle, in front of which it is declivous to apex, anteriorly separate and pilose, posteriorly densely punctured except over

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two shining lateral impressions, with thin pubescence at sides and a dense patch before scutellum, which is large, shining, and rounded. Elytra as wide but not as long as prothorax, basal borders feebly convex, shoulders narrowly elevated; at first cylindrical, then obliquely declivous from basal fourth to apex, shining and irregularly punctured, the punctures rugose and confluent along basal margin; apical declivity rounded oval with a sharp raised margin to sides and lower border, its surface subconvex, pilose, with impunctate striæ, interstices closely granulate; lateral border of elytra declivous, parallel throughout to margin of apical declivity. Underside black, thinly pubescent, anterior coxæ separated by a narrow prosternal process. Legs ferruginous, tibiæ strongly dilated and obsoletely spined; tarsi short, their first three joints compressed, and pilose beneath.

The most extreme type of the truncate *Xylebori* I have seen, and a remarkable instance of the diversity of form which the genus presents.

Xyleborus brevis, Eichh.

Eichh., Rat. Tom., p. 319.

Four examples, Nikko; originally taken at Hagi by Hiller. Identified by the description.

Xyleborus lewisi, sp. n.

Fem. Oblonga, cylindrico-convexa, pilosa, rubra elytris infuscatis; prothorace subgloboso, apice tamen deplanato, supra subaequaliter convexo, opaco, antice fortiter postice paullo subtilius asperato; elytris subnitidis, striato-punctatis, interstitiis subtiliter biseriatim punctatis in declivitate tuberculatis, apice oblique declivi ad suturam impresso. Long. 4·5 mm.

Nikko, Hakono, Miyanoshita, nine specimens.

Oblong, convex, and cylindrical, pilose with long hairs, red with elytra infuscate. Head coarsely and rugosely punctured, with an indistinct elevated median line, thinly hairy and ciliate over mouth. Prothorax transverse, nearly globose, but with sides and apex separately rounded and antero-lateral angles more strongly rounded, base subsinuate with obtusely rounded angles; above gibbous and convex, but without median elevation, dull and entirely scabrous, the asperities a little weaker posteriorly. Scutellum rounded, shining, infuscate, anteriorly impressed. Elytra as wide as base of prothorax and more than one-half longer, truncate at base,

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with humeral angles rounded-rectangular, sides straight but subdivergent to apex, which is rather abruptly and broadly rounded and inconspicuously carinate below; surface very convex with scarcely impressed irregular striæ of large shallow punctures and long coarse pubescence, especially at apex, interstices finely punctured in irregular double rows, declivity very convex, with first interstice widened, impressed and finely tuberculate, the second very strongly, the rest less strongly tuberculate.

The largest Japanese species of the genus; very like *X. rubricollis*, Eichh., in colour and in the completely asperate prothorax, but very much larger, and with the elytral interstices punctured in double instead of single rows. The prothorax is flattened in front, a feature not found in other species with a short subglobose prothorax.

Xyleborus rubricollis, Eichh.

Eichh., Scol. Jap., p. 202; Rat. Tom., p. 330.

No further examples taken.

Xyleborus apicalis, sp. n.

Fem. Oblonga, subnitida, longius pilosa, piceo-nigra, antennis pedibusque ferrugineo-testaceis; prothorace orbiculato, transverso, margine antico tuberculato, disco transverse elevato, postice subtiliter punctato, margine basali hirto; elytris prothorace sesqui longioribus, lineato-punctatis, interstitiis irregulariter punctatis, setosis, ad apicem convexe declivibus, praeter suturam impressis, interstitio 2o in summa declivitate obtuse spinato, 3o elevato, tuberculato. Long. 3 mm.

One specimen, without locality.

Oblong, pitchy black with antennæ and legs reddish testaceous. Head finely reticulate, front with scattered strong punctures, thinly hairy, mouth ciliate. Prothorax transverse, truncate at base, basal angles obtusely rounded, sides and apex rounded, the latter more strongly and tuberculate; surface with a median transverse elevation, anteriorly exasperate, posteriorly with fine scattered aciculate punctures, with long pubescence scattered at sides and apex, denser along basal margin. Scutellum triangular, piceous. Elytra rather narrower at base than greatest width of prothorax, and one-half longer, humeral angles obtuse, sides rounded from middle to apex, which is somewhat obtuse; surface cylindrical at base, with rows of punctures, very fine at base becoming strong

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about middle, interstices with an irregular series, usually double, of finer setigerous punctures, apical declivity convex, strong but not abrupt, not acutely carinate below, impressed on either side of suture and margined by the elevated and finely tuberculate 3rd interstice, 2nd interstice with a short obtuse spine at upper angle of declivity, hairs long, especially towards apex.

Not unlike *X. atratus*, Eichh., but distinguished by the prothorax being finely punctured behind, the elytral interstices being biseriately punctured, and the tubercle on the third. Separable by the structure of the prothorax from *Dryocœtes pilosus* and *affinis*.

Xyleborus atratus, Eichh.

Eichh., Scol. Jap., p. 201 ; Rat. Tom., p. 324.

A few more specimens taken at Kiga and Nagasaki.

Xyleborus germanus, sp. n.

Fem. Breviter cylindrica, nitida, picea, antennis pedibusque testaceis ; prothorace subgloboso, convexo, indistincte transverse elevato, anterius exasperato, posterius subtiliter punctulato, margine basali medio piloso ; elytris prothorace sesqui fere longioribus, ad apicem oblique declivibus et infra carinatis, subtiliter striato-punctatis, interstitiis rarius uniseriatim punctatis in declivitate seriatim pilosis. Long. 2—2·3 mm.

Apparently common ; sixteen specimens altogether have been taken at various places, two or three at most from each.

Oyayama, Nikko, Subashiri, Kiga, Miyanoshita.

Short, cylindrical, piceous, shining. Head finely reticulate, with front convex, scantily punctured, mouth ciliate ; eyes flat, oblong, deeply emarginate. Prothorax as long as broad, base truncate, basal angles rounded, sides scarcely rounded behind, broadly in front; surface convex with an obtuse median transverse elevation, anteriorly with concentric rows of exasperations, strong over apex, posteriorly shining with scattered fine punctures, pubescence short and sparse, except at apex and in middle of basal margin. Scutellum large, subtriangular, shining. Elytra as wide as thorax, and nearly twice as long ; humeral angles obtusely rounded, sides subparallel to apex, which is abruptly and broadly rounded and carinate below ; surface convex, somewhat rounded from base to middle, then obliquely but not abruptly declivous, piceous-brown,

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with fine rows of punctures which appear impressed in certain lights, interstices rather wide, flattish, each with a row of very fine punctures, and behind middle with erect setæ arising from slight tubercles. Underside brown, punctured, pubescent. Legs testaceous.

Closely allied to *X. compactus*, Eichh., but twice as large, with distinct though feebly impressed elytral striæ and regular rows of hairs on the apical declivity, which are confined to the interstices.

Xyleborus compactus, Eichh.

Eichh., Scol. Jap., p. 201 ; Rat. Tom., p. 328.

No further examples taken. The hairs are shorter and more depressed at the apex of the elytra than in the last species, and arise from the striæ as well as from the interstices.

Xyleborus semi-opacus, Eichh.

Eichh., Rat. Tom., p. 330.

Five specimens, Konose, Kioto, Chiuzenji ; also at Hong-Kong in China (*J. J. Walker*).

The type is not in Mr. Lewis's collection, but the species is unmistakable. In certain lights rows of punctures can be seen on the elytra, but they are not at all clear, and cannot be confounded with the distinct lines occurring in most of the genus.

Xyleborus concisus, sp. n.

Oblongus, nitidus, ferrugineus, prothorace et elytris ad apices infuscatis, breviter ac parce pilosus ; prothorace transverso lateribus leniter, apice fortius rotundato et crenato, supra in medio obtuse transverse elevato, postice discrete punctato ; elytris latitudine a basi crescentibus, lateribus rectis, apice rotundato, striato-punctatis, interstitiis subtilius uniseriatim punctatis, declivitate valde obliqua, ante medium incipiente, subconvexa, squamis obtecta, striata. Long. 2·4 mm.

One example, without locality.

Oblong, ferruginous, with apex of prothorax and elytra slightly infuscate. Head piceous, finely reticulate, front subconvex, sparsely and strongly punctured towards sides and scantily pubescent, with a transverse impression over mouth, above which is a somewhat

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tuberculate elevation. Antennæ testaceous. Prothorax transverse, not narrowed towards apex; base truncate, posterior angles rounded, sides and apex rounded, the former very feebly, the latter more strongly, with margin crenate; surface with an obtuse transverse elevation in middle, rather finely asperate anteriorly, posteriorly with distinct scattered punctuation. Scutellum triangular, shining. Elytra rather less than twice as long as prothorax, and as wide at base, which is truncate, with the humeral angles nearly rectangular, sides straight but divergent to apex, which is circularly rounded and narrowly emarginate at suture; surface at base cylindrical and longitudinally convex, striato-punctate, interstices flat, with a single row of very fine punctures, apical declivity sharply marked, very oblique, beginning before middle of elytra, dull and clothed with cinereous scales, subconvex, impressed along inferior margin which is acute, striate, the interstices flat. Underside testaceous, thinly pubescent. Legs testaceous, the anterior tibiæ obliquely truncate and uncinate at apex, middle and posterior tibiæ rounded.

This species corresponds closely to Eichhoff's description of *X. sordicauda*, Motsch., from which it differs in no important respect except in size. *X. sordicauda* is said to be twice as large as *X. semi-opacus*, Eichh., whereas this specimen is rather smaller.

Minor points of difference from the description of *X. sordicauda* are found in the prothorax, which is not contracted anteriorly, and in the elytra being dilated posteriorly, with the apical margin more strongly rounded. I conclude that it is distinct, and that we have an instance of what is common in the genus, a well-marked form represented by more than one species. It may easily be separated from *X. semi-opacus* by the punctured striæ of the elytra.

Xyleborus validus, Eichh.

Eichh., Scol. Jap., p. 202; Rat. Tom., p. 358.

Taken in greater numbers than any other species; extending from Sapporo and Junsai in Yezo, to Nagasaki and Oyayama in Kiushiu, also at Nikko, Miyanoshita, etc. As there is a closely allied and hardly distinguishable species from Ceylon, it represents an Oriental rather than a Palæarctic type. It is found in firs.

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Xyleborus obliquecauda, Motsch.

Phlœotrogus obliquecauda, Motsch., Bull. Mosc., 1863, i., p. 513.
Xyleborus carinipennis, Eichh., Berl. Zeit. 1868, p. 152.
X. obliquecauda, Eichh., Rat. Tom., p. 351.

One specimen, near Yokohama, Oct. 7th, 1881. It appears to me identical with examples taken by Mr. Lewis in Ceylon, and corresponding to Eichhoff's description of *X. obliquecauda*. The prothorax is a trifle more depressed, and the elytral striæ more regular and not at all impressed; but there is no more variation than might be expected between specimens from distant localities.

Xyleborus aquilus, sp. n.

Fem. Oblonga elongata, nitida, breviter pilosa, ferrugineo-picea, antennis pedibusque ferrugineis; prothorace subquadrato, lateribus et apice singulatim leniter rotundatis, in medio transverse gibboso, postice subtiliter disperse punctato; elytris ad apicem oblique declivibus, infra subtiliter carinatis, leniter striato-punctatis, striis in declivitate impressis, interstitiis planis uniseriatim setosis, in declivitate convexis, tuberculatis. Long. 3·2—3·5 mm.

Six examples taken at Oyayama and Hitoyoshi in Kiushiu, one near Kashiwagi.

Somewhat similar to *X. eurygraphus*, Ratz, but narrower and less convex, with the prothorax shorter and less evidently quadrate, the elytral striæ much finer, and the interstices convex at apex, more finely and evenly tuberculate. Ferruginous-brown or piceous; head dull, front punctured, thinly pubescent, with an obsolete median raised line. Prothorax a little longer than broad, truncate at base, with posterior angles obtusely rounded, sides and apex separately slightly rounded, antero-lateral angles more strongly; surface gibbous in middle, the elevation transverse but short, its anterior half rather finely asperate, the posterior half shining, scantily and finely punctured. Scutellum small, triangular, shining. Elytra slightly narrower than prothorax at its widest part and about one-half longer, humeral angles rounded rectangular, sides parallel to apex then subcircularly rounded and margined; surface slightly convex from base to declivity, which is oblique, with fine punctured striæ, little or not at all impressed before apex, where they are dilated, with a slight outward curve, interstices with a single row of setæ, flat anteriorly, convex at

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apex and finely tuberculate, the first having traces of tubercles from the middle. Underside ferruginous, thinly hairy.

There are two forms of this species, one slightly shorter with the elytral striæ not impressed at all on the declivity, which is impressed transversely, somewhat dull, and sub-acuminate at apex; the tubercles are finer than in the other form, in which the striæ are impressed, and the apex is shining and subconvex. One specimen, however, appears to be intermediate, and therefore I do not separate them, though at first sight they appear specifically distinct.

Xyleborus praevius, sp. n.

Fem. Elongata, subcylindrica, nitida, parce pilosa, picea, antennis pedibusque testaceis; prothorace paullo longiore quam latiore, lateribus leniter, apice fortiter rotundato et crenato, disco umbonato, postice sparsim distincte punctato; elytris prothorace plus quam sesqui longioribus, ad apicem oblique declivibus et infra carinatis, declivitate utrinque subimpressa, supra subtiliter lineato-punctatis, interstitiis rarius uniseriatim punctatis, postice obsolete tuberculatis. Long. 3 mm.

One example, without locality.

Similar to *X. aquilus*, but smaller, more slender and with the interstices flat on the apical declivity.

Head dull with front flattened, coarsely punctured at sides, with a smooth elevated area in middle, pubescence short except over mouth, eyes wide, not deeply emarginate, antennæ testaceous. Prothorax a little longer than broad, its base truncate, basal angles obtuse, sides scarcely rounded behind, becoming gradually more strongly rounded to apex, which is crenate, surface elevated in middle, the elevation not evidently transverse, anterior half with rather scattered transverse asperities, becoming very fine over median elevation, posterior half shining, with irregular scattered but distinct punctures. Scutellum small, obtuse triangular, shining. Elytra as wide as base of thorax, and more than half as long again, humeral angles obtusely rounded, sides not quite parallel, slightly dilated in middle, subcircularly rounded and carinate at apex, surface slightly convex from base to apex, thence somewhat obliquely declivous, with rows of shallow punctures, which are not impressed, interspaces between punctures transversely rugose, interstices with a single row of setæ, arising from fine tubercles on the whole of the first two, and the apice

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of the remaining interstices. Apical declivity with a shallow impression on either side of the suture. Underside ferruginous, with abdomen darker, very scantily punctured and pubescent. Legs reddish testaceous.

Xyleborus seriatus, sp. n.

FEM. Oblonga, cylindrica, subnitida, pilosa, fusco-picea elytris dilutioribus, antennis pedibusque rufescentibus ; prothorace longitudine et latitudine aequali, apice fortiter, lateribus paullo rotundatis, supra transverse subelevato, postice subtiliter reticulato et fortiter punctato, linea media laevi ; elytris ad apicem oblique declivibus, declivitate subimpressa subtus haud acute carinata, setis alterne longioribus et brevioribus seriatis, lineato-punctatis, interstitiis uniseriatim punctatis versus apicem tuberculatis. Long. 2·5 mm.

Two examples taken at Nikko and Miyanoshita.

Oblong, cylindrical, dull piceous with elytra lighter. Head finely reticulate, front nearly flat, scantily punctured and pubescent, with an indistinct median longitudinal elevation, mouth ciliate, eyes deeply emarginate, antennæ testaceous. Prothorax as broad as long, truncate at base with posterior angles obtuse, sides slightly rounded, in front strongly rounded to apex ; above with an obtuse transverse elevation in middle, anterior half asperate, posterior half finely reticulate and strongly punctured, the punctures becoming asperate at sides, with a smooth median line, pubescence short and scanty. Scutellum small, rounded, piceous. Elytra as wide as prothorax, and more than half as long again, truncate at base with humeral angles rounded rectangular, sides parallel to middle, then obliquely and gradually rounded to apex ; surface cylindrical to middle, obliquely declivous behind, the declivity impressed weakly at sides of suture, with inferior margin inflexed but not carinate, with scarcely impressed rows of strong close setigerous punctures, the setæ very short and fine, interstices with a single row of punctures, a little finer and less numerous, bearing longer setæ, and very finely tuberculate for apical half. Legs ferruginous.

This species resembles *X. dryographus*, Ratz., but the prothorax is shorter and more strongly punctured behind. The elytral punctuation is much stronger, and the rows of shorter and longer setæ are quite distinctive. It is allied to Eichhoff's section + + +, in which the prothorax is defined as being cylindrical and oblong; but in this species the prothorax is so short, that it will not serve to separate it from the insects of section +.

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Xyleborus pelliculosus, Eichh.

Eichh., Rat. Tom., p. 336.

Two examples, Kiga.

I have not seen the type of this insect, and am less certain, than with other unseen species, that I have here the true *X. pelliculosus*. But the description fits it, and my doubt is rather owing to the fact that there exist other at present undescribed species of similar *facies* in the Oriental region. It is quite easily distinguished by the rather dense and almost downy pubescence, and the confusedly and finely punctured elytra, which bear only the feeblest traces of striæ. One example is black, the other sordid testaceous. The shape of the prothorax would lead me to put it in Eichhoff's group + + + rather than +, but it is a distinct form, and not very closely related to any other described species. I have placed it in the neighbourhood of *X. muticus*, which is of similar build, without evident elevation of the prothorax, but that species has the elytra plainly lineato-punctate.

Xyleborus muticus, sp. n.

Fem. Elongata, cylindrica, subnitida, pilosa, rufo-picea, antennis pedibusque ferrugineis; prothorace oblongo, antice fortiter rotundato, supra parum gibboso, post medium punctis sulaciculatis subtilibus notato; elytris lineato-punctatis, interstitiis subtilissime uniseriatim punctatis et pilosis, apice fortiter declivi, ad suturam subimpresso, striis impressis, interstitiis vix perspicue tuberculatis. Long. 3 mm.

Two examples, near Kashiwagi.

Ferruginous-pitchy, with rather long soft pubescence. Head ferruginous, dull, front convex, punctured at sides with a median impunctate slightly raised line, pubescence scanty and short except over mouth; antennæ ferruginous. Prothorax oblong, base truncate, basal angles obtusely rounded, sides straight, slightly divergent from base towards apex, which is strongly rounded; surface with only the slightest trace of a transverse elevation, thinly pubescent especially at sides and apex, its anterior third with rather close transverse asperities which become weaker, but are continued back to posterior third, which is very finely reticulate, dull and subaciculately punctuate, the punctures rather close at the sides. Scutellum rounded, piceous, shining. Elytra slightly

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wider than prothorax at base and about half as long again, humeral angles subrectangular, shoulders narrowly callose, sides parallel to behind middle, thence rounded to apex, which is not carinate below ; surface cylindrical with slightly impressed rows of oblong punctures, interstices narrow with a single row of very fine setigerous punctures, about as numerous as those of striæ, the hairs stronger towards apex, which is strongly but obliquely declivous, slightly flattened, and impressed along the suture with the punctures of the striæ larger, rounded, and shallow ; interstices flat with microscopic traces of tuberculation, rather more evident on the third interstice. Underside and legs ferruginous, the former shining, punctured, and pubescent.

In the feeble development of any apical armature to the elytra, this species differs from any described by Eichhoff. Other examples of the same type occur in the Oriental and Polynesian regions, *e.g.*, *X. obliquus*, Sharp, from Hawaii.

Xyleborus festivus, Eichh.

Eichh., Scol. Jap., p. 202; Rat. Tom., p. 366.

No further examples have been taken.

Xyleborus glabratus, Eichh.

Eichh., Rat. Tom., p. 381.

Yokohama, Higo ; a few specimens.

Xyleborus bicolor, sp. n.

Fem. Elongata, cylindrica, nitida, subglabra, capite et prothorace ferrugineo-testaceis, elytris fusco-piceis, antennis pedibusque testaceis ; prothorace oblongo, antice fortiter rotundato, in medio subgibboso, postice sparse punctato, linea media obsolete elevata laevi ; elytris ad apicem oblique declivibus et infra carinatis, subtiliter lineato-punctatis, interstitiis 1o et 3o ad apicem tuberculatis. Long. vix 2 mm.

Four examples, Nagasaki, Feb. 21st, 1881 ; one at Inasa on *Kashinoki* (*Ilex* sp).

Reddish testaceous with the elytra piceous brown. Head finely reticulate, front flattened, impressed on either side with a group of punctures, pubescence very scanty, mouth ciliate. Eyes oval with a deep angulate emargination. Antennæ testaceous. Prothorax oblong, base truncate, basal angles obtusely rounded, sides

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nearly straight, slightly divergent from base to near apex, which is strongly rounded, surface somewhat depressed, declivous for anterior third, its junction with the posterior cylindrical part marked by a fine elevation at the apex of an indistinct raised line reaching nearly to base ; finely asperate in concentric lines before elevation, with sparse short hairs, basal half shining, feebly punctured, with a row of more distinct punctures on either side of central line. Scutellum rounded, piceous, shining. Elytra as wide as base of prothorax and half as long again, basal angles rounded rectangular, humeral callosities distinct, sides subparallel, apex circularly rounded and acutely margined below by the 7th interstice ; surface subdepressed, very obliquely declivous at apex, punctured in rows, interstices flat with a single row of very fine sparse punctures ; declivity with 1st and 3rd interstices elevated, finely tuberculate and setose. Underside and legs testaceous, the former punctured at sides and at apex of abdomen.

Readily distinguished by its small size, narrow form, fine sculpture and colour.

Xyleborus attenuatus, sp. n.

Fem. Elongata cylindrica, a prothorace medio posterius subangustata, subnitida, pilis erectis brevibus pubescens, picea ; prothorace oblongo, in medio transverse elevato, postice sublaevi, punctis minutis notato ; elytris ad amussim punctato-striatis, interstitiis uniseriatim punctatis, apice subopaco, oblique rotundato, sutura elevata, interstitiis 1o, 3o, et 4o tuberculatis, 2o inermi. Long. 2.6. mm.

One example, Nikko.

Very closely allied to *X. saxeseni*, Ratz., like the following species, but in my opinion distinct from either. From *X. saxeseni* it differs as follows :

The body is more elongate and evidently narrowed, especially towards the apex of the elytra, and is furnished throughout, including the posterior half of the prothorax, with short upstanding hairs ; thoracic tubercle more elevated, the surface behind less shining, more evidently and closely punctured ; elytral punctures stronger and rather closer, 2nd interstice more deeply impressed at apex, and the tuberculation stronger ; third stria also somewhat impressed. From *X. sobrinus* it can be distinguished by its larger size, the distinct and regular rows of punctures on the elytra,

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and the wider space between the two inner rows of tubercles on the apex, which is distinctly punctured in the line of the two first striæ.

Xyleborus sobrinus, Eichh.

Eichh., Scol. Jap., p. 202; Rat. Tom., p. 363.

Four specimens added from Chiuzenji.

Somewhat variable in the sculpture of the elytra and the development of the elytral tubercles, which are usually much stronger than in any specimens of *X. saxeseni*. The tubercles of the 1st interstice begin about the middle of the elytra, whereas in the single example of *X. attenuatus* they are confined to the declivity.

A specimen from Hiogo in Colonel von Schönfeldt's collection is not separable from *saxeseni* by any characters. As it is quite possible that there may be two or three species allied to *saxeseni* in Japan, I allow this and the preceding species to stand as a help for further investigations.

Xyleborus adumbratus, sp. n.

Fem. Oblonga, cylindrica, nitida, pilis erectis adspersa, nigra vel picea, prothorace nonnunquam rufescente, antennis pedibusque testaceis, his infuscatis; prothorace oblongiusculo, apice fortiter rotundato, in medio transverse elevato, postice sparse subtiliter punctulato; elytris punctato-striatis, interstiis subrugosis, uniseriatim subtiliter punctatis et pilosis, duobus primis a basi tuberculatis, apice declivi deplanato, sutura ad apicem solum callose elevata, interstitiis 1o et 3o tuberculis acutis ornatis. Long. 3 mm.

Eight examples taken at Nagasaki, Hitoyoshi, Oyama, and Subashiri.

Closely allied to *X. pfeili*, Ratz., of which it is perhaps a mere geographical variety.

It varies in colour from black to piceous brown, with the thorax sometimes lighter than the elytra. Head as in *X. pfeili*, with the front strongly punctured, with a more or less evident longitudinal carina. Prothorax as in *X. pfeili*, but with the hairs longer, and the central elevation more prominent and transverse; its basal half very shining, diffusely punctured except behind elevation, where the punctures are closer. Elytra one half longer than prothorax, a little shorter and more convex than in

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X. pfeili; sides parallel at base, slightly narrowed and rounded behind middle, apex feebly produced in middle, sinuate on either side; their sculpture similar to that of *X. pfeili*, but with the punctuation a little stronger and the points of insertion of the hairs on the two first interstices more or less evidently elevated and tuberculate. Apical declivity with suture not elevated except at apex, where it is callose, the tubercles more prominent, and surface less wrinkled and more clearly punctured. Underside piceous, or testaceous, with abdomen darker.

Xyleborus badius, Eichh.

Eichh., Berl. Ent. Zeit., 1868, p. 280; Rat. Tom., p. 379.

Hiogo, one example (*von Schönfeldt*).

I can see no difference whatever between this insect and a typical example from Madagascar.

Xyleborus vicarius, Eichh.

Eichh., Scol. Jap., p. 203; Rat. Tom., p. 376.

No further examples taken.

The apical declivity of the typical specimens is decidedly dull, as in *X. affinis*, Eichh., and not shining as described by Eichhoff.

Xyleborus minutus, sp. n.

Fem. Oblonga, nitida, pilis brevibus erectis ornata, ferrugineo-testacea; prothorace latitudine paullo longiore, lateribus leniter, apice fortiter rotundato, supra in medio elevato-nodoso, postice discrete subtiliter punctulato; elytris lineato-punctatis, interstitiis vix perspicue uniseriatim punctatis, ad apicem oblique declivibus, declivitate deplanata, subimpressa, interstitiis omnibus subtilissime post medium tuberculatis, versus apicem muticis. Long. 1·5—1·7 mm.

Three examples, Inasa.

At present the smallest species in the genus, shorter though more robust than *X. bicolor*.

Oblong, subcylindrical, testaceous-brown, a little darker at the extremities. Head finely reticulate, testaceous with epistoma darker, front subconvex, punctured at sides and shortly pubescent, with a median longitudinal elevation towards vertex, carinate in one example, mouth shortly ciliate, eyes oval, flat, emarginate,

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antennæ testaceous. Prothorax a little longer than broad, slightly rounded at base, basal angles obtuse, sides gently rounded to near apex, which is strongly rounded; surface with a slight nodose elevation in middle, scantily pubescent at sides and apex, its anterior half with concentric asperations, the posterior half shining, finely punctured with a groundwork of very fine parallel scratches. Scutellum rounded, shining, infuscate. Elytra as wide as base of prothorax and rather less than half as long again, base truncate, humeral angles subrectangular rounded, sides very feebly rounded, nearly parallel, apex strongly rounded, with the lateral margin inflexed below for a very short distance, but scarcely carinate; surface shining, convex from base to posterior third, thence obliquely declivous, the declivity flattened and more or less impressed, with rows of punctures which appear large, rounded, and dark when strongly illuminated, interstices somewhat irregular, with single rows of very fine sparse punctuation and short erect hairs, behind middle with fine tuberculation, obliterated on the impressed apical area on which the striæ are slightly impressed, and curved inwards at the tip. Underside and legs testaceous.

Xyleborus schaufussi, sp. n.

Elongatus, cylindricus, nitidus, ferrugineo-brunneus vel piceus, pilosus; prothorace oblongo, apice rotundato supra vix gibboso, postice subtiliter punctulato; elytra subtiliter lineato-punctatis, striis haud impressis, interstitiis discretius uniseriatim punctatis, apice retuso, laevi, ad suturam profunde impresso, lateraliter utrinque elevato, tuberculis 4 aut 5 ornato.

Mas. Minor, angustior.

Long. Mas.—2·7 mm.; Fem.—3 mm.

Several examples taken at Lake Junsai and Nikko.

Varying in colour from ferruginous-brown to piceous. Head dull, front convex strongly punctured at sides, smooth in middle with a slight longitudinal elevation over mouth; pubescence grey, rather long, mouth ciliate with yellow hairs, eyes not deeply emarginate, antennæ testaceous-brown. Prothorax oblong, narrower in male than in female, base truncate, basal angles rounded, sides parallel, apex strongly rounded; surface with only a trace of a central elevation, with very short scanty pubescence, longer at sides and apex, its anterior third with rather fine imbricate asperities, basal part shining, finely punctured with an indistinct smooth central line. Scutellum very small, triangular, depressed. Elytra barely as wide as prothorax and rather more than half as

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[illegible] at base, humeral [illegible] sides parallel [illegible] apices nearly truncate, [illegible] emargination; surface [illegible] with a single row of [illegible] as those of striæ, and [illegible] posteriorly: behind [illegible] deeply impressed [illegible] the depression smooth, [illegible] four or five tubercles [illegible] interstices, first and [illegible] fine tubercles before apical [illegible] punctured at sides and [illegible] with knees infuscate. [illegible] smaller and more slender.

The impression of the elytral apex is much deeper than in [illegible], and resembles that of certain [illegible].

[illegible], sp. n.

Fem. Elongata, cylindrica, ferrugineo-brunnea, breviter pilosa; prothorace oblongo, apice rotundato, supra leniter gibboso, postice distincte sparsim punctato; elytris lineato-punctatis, interstitiis uniseriatim punctatis, apice subcirculatim excavato retuso, infra emarginato, in retusionis margine dentibus duobus acutis utrinque armato. Long. 3 mm.

One specimen, Sapporo.

Similar to the last species, but with the following distinctive features:

Body stouter and more convex; prothorax slightly narrowed towards the apex and not regularly rounded, median elevation evident, though small, punctuation of the basal half stronger and rather irregular. Punctures of the elytra stronger and less numerous, interstices somewhat rugose; apex widely impressed, with the elevated callose margin subcircular, but not reaching the suture below, so that the lower border has a shallow emargination, impressed surface shining and impunctate; there are, on each side, two minute tubercles before it close to the suture, and two spines just within the lateral margin, one near the upper extremity, the other about the middle. Antennæ, legs and underside ferruginous.

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I have not seen *X. fallax*, Eichh., to which this species is allied in the structure of the elytra; but the former differs according to the description in several points. It is more elongate, with the posterior half of the prothorax very finely punctured, the apical emargination of the elytra deep, and the impressed surface rugosely punctured.

Xyleborus exesus, sp. n.

Fem. Elongata, cylindrica, nitida, parce pubescens, piceo-nigra, antennis pedibusque ferrugineis; prothorace oblongo, parum gibboso, postice distincte ac discrete punctato, linea media laevi; elytris lineato-punctatis, interstitiis subtilius uniseriatim punctatis subrugulosis, apice oblique declivi, fortiter excavato-retuso, margine elevato utrinque bispinato, infra subcirculatim emarginato. Long. 3·6 mm.

Two examples, Miyanoshita.

Cylindrical, pitchy-black. Head dull, convex, with long thin pubescence, mouth ciliate, front punctured at sides, with an elevated smooth space widened behind and impressed in middle, eyes broad oval, anteriorly emarginate, antennæ ferruginous. Prothorax about one-half longer than broad, base slightly rounded, basal angles obtusely rounded, sides subparallel behind becoming rounded gradually and more strongly towards apex; surface cylindrical behind, declivous in front, but without median elevation, its pubescence thin, rather long at apex and sides, absent over basal area, anterior half with fine imbricate asperities, posterior half shining, distinctly punctured, with a smooth central line, the punctures stronger and more scattered towards the base. Scutellum small, rounded, not depressed. Elytra as wide as prothorax, and rather more than half as long again, base truncate, shoulders subrectangular rounded, sides parallel to behind middle, thence gently rounded to apical border, which is strongly and almost abruptly rounded, with the median third subcircularly emarginate; surface shining, gently convex from base to apex, with a few hairs, distinctly punctured in rows, first stria with punctures stronger towards base, but not impressed; interstices rugose, with a row of fine scattered punctures, the first widened posteriorly with two or three fine tubercles before declivity, which is very oblique, beginning at the base of the posterior third of the elytra, and excavate; the excavation smooth, impunctate, and shining, with the suture narrowly elevated, its lateral margins sharply

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raised, crenate, fringed with a few long hairs, and armed with two spines, one small, near the suture, at the apex of the 2nd interstice, the other about the middle, at the apex of the 5th interstice, longer and directed backwards. Underside deep ferruginous. Legs ferruginous with knees infuscate.

Readily distinguished from *X. defensus* by its larger size, colour, and the obliquity of the apex, the impressed surface of which is not circular but elongate; the apical emargination is much deeper and more abrupt. It is allied to *X. emarginatus*, Eichh., but as the apical impression in that species is described as being subrugose and somewhat closely punctured, it is obviously distinct. This type of *Xyleborus*, with an impressed, emarginate, and spined apex to the elytra, appears to be rather common in the Oriental region. I have other undescribed species in my collection, which can easily be separated by comparison, though they run very close in structural features. They are, in spite of their shape, true *Xylebori*, and show no generic differences upon dissection.

It is a peculiarity of this genus that the descriptions and differentiations of the species it contains are based almost entirely on the characters of the females. The males are so rarely taken, that but very few have ever been described among exotic species. As they are subapterous, and incapable of flight, they are not to be obtained except by a special search in the burrows they inhabit, a task usually too tedious to be attempted by a collector who is devoting his attention to one or more Orders in a foreign country. A further acquaintance with them would be of material assistance towards grouping the species of the genus, as, though small and ill-developed in comparison with the females, they present some well-marked differences of structure. In form they are of two types, one, short and subglobose, as *X. dispar* ♂, the other, cylindrical and similar to the female, but shorter, often more convex and less robust, as *X. saxeseni* ♂, and *X. schaufussi* ♂. For the insects whose males are of the former type, Ferrari has proposed the genus or subgenus *Anisandrus*, which is at present of no use, as one cannot yet say with certainty what characters of the female are connoted with that particular type of male, which probably merges into the

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other by intermediate forms. Other differences, besides those of form, are found in the prothorax, which is frequently impressed in front, and furnished with a structure on its apical margin, varying from a minute tubercle, as in *X. dryographus* ♂, to a spine; in some species, as in *X. coronatus*, Eichh., from Venezuela and Brazil, and others from Madagascar, this median spine is strongly developed and bifid, and there are two lateral processes. In the present collection the males of but two species are associated with their females, *X. vicarius*, Eichh., and *X. schaufussi*, m.; there are, moreover, the males of three species which I cannot assign with certainty to any female forms, and am compelled to describe under separate provisional names. The dates and localities of capture have proved of no assistance towards identifying them. In one species, *X. cucullatus*, the anterior margin of the prothorax presents a new modification, being produced obliquely forwards and downwards into a flat plate, which completely conceals the head, in a second, *X. orbatus*, there is no process of the prothorax, and the general type is that of *X. dispar* ♂, while the remaining species, *X. galeatus*, has a deep anterior prothoracic impression with a strong apical spinous process which conceals the head, and is of the type of *X. eurygraphus* ♂, Ratz.

Xyleborus cucullatus, sp. n.

Mas. Breviter oblongus, subnitidus, pilosus, piceo-niger, antennis pedibusque ferrugineis, prothorace longitudine et latitudine subaequali, a basi fere oblique declivi, deplanato, et in lobum transversum marginatum supra caput producto, dense punctato, punctis versus apicem exasperatis; elytris lineato-punctatis, interstitiis multipunctatis, ad apicem fortiter declivibus, subtruncatis, declivitate subconvexa, immarginata, striata, granulata. Long. 2—2·6 mm.

Four examples, Kurigahara, and Konose in Higo.

Short, oblong, slightly shining, lighter or darker piceous, with rather long pubescence. Head completely hidden from above and in front, ferruginous, smooth and indistinctly punctured, pubescence almost absent, eyes very small, quite flat with few facets antennæ ferruginous, of the usual structure, the sensitive surface

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of club very oblique. Prothorax rather broader than long (its apparent length varying according to the angle at which it is viewed), base truncate, basal angles obtusely rounded, sides rounded, above obliquely declivous and flattened anteriorly, the declivity prolonged backwards in the middle line to basal third, anterior border produced in a line with the declivous surface into a transverse lobe, covering head, its margin rounded and elevated; surface obtusely elevated behind apical lobe and at sides of declivity, closely punctured, and with a more or less evident smooth median line from base to middle, the punctures finely asperate anteriorly for a variable distance, interspaces finely reticulate. Scutellum small, rounded triangular. Elytra narrower than prothorax, an about one third longer, base truncate, basal angles rounded, humeral elevations scarcely traceable, sides parallel to behind middle, thence rounded to apex; surface convex, subcylindrical at basal half, with indistinct rows of punctures, interstices multipunctate, apex very strongly but obliquely declivous, the declivity subconvex, circular in outline, not acutely margined, granulately punctured and indistinctly striate. Legs rather long, apices of anterior tibiæ subtruncate, outer margin of middle and posterior tibiæ broadly rounded serrate.

The specimens vary in colour, gloss, and the closeness and degree of asperity of the thoracic sculpture. One example from Higo is at first sight very different. It is smaller, darker, more truncate, with the prothorax shorter and the anterior lobe more declivous. It may quite possibly be the male of a different species, but presents no essential differences of structure or sculpture. *X. cucullatus* is perhaps the male of *X. brevis*, Eichh., and is certainly allied to it; but the Higo example alone appears small enough to stand as the male of that species, and in all the rows of punctures on the elytra are more evident than in *X. brevis*. The specimen from Kurigahara has been placed, by Mr. Lewis, on the same card with the next described species, as the corresponding sex. But I do not see my way to accepting this. If it be so, *X. cucullatus* must be the female, and in all characteristics it is a male; the generative organs, as far as I have been able to examine them, agree with those of *X. dispar* ♂, the elytra appear to be soldered, and the wings are either completely absent or very minute.

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Xyleborus orbatus, sp. n.

Mas. Brevis, subglobosus, subnitidus, ferrugineus, longius pilosus, prothorace transverso, aeque rotundato convexo, anterius exasperato, posterius rugoso; elytris a basi usque ad apicem rotundatis, lineato-punctatis, interstitiis subrugosis uniseriatim punctatis. Long. 1·5 mm.

One example taken with the last species at Kurigahara.

Of the type of *Xyleborus dispar*, ♂. Very short and subglobose, somewhat depressed, ferruginous with very long scattered pubescence. Head with front nearly flat, reticulated, sparingly punctured and pubescent, eyes small, antennæ testaceous. Prothorax one-third broader than long, base truncate, basal angles very broadly rounded, sides and apex strongly rounded, surface uniformly but not strongly convex from base to apex, which is not produced in front, asperate anteriorly, the asperities becoming more scattered and punctiform towards base, interstices finely reticulate except at extreme base. Scutellum triangular. Elytra as wide as prothorax and half as long again, with humeral angles rounded, sides rounded from base to apex, rather more strongly behind middle, surface uniformly convex with indistinct rows of shallow punctures, interstices with a single series of punctures bearing long hairs. Legs long, slender, testaceous; tibiæ feebly dilated and spined.

This insect may be the male of *X. germanus*, M., or *semi-opacus*, Eichh. I have described it for the sake of completeness, and not because I think that any useful purpose is served by describing these isolated males unless they exhibit some salient features.

Xyleborus galeatus, sp. n.

Mas. Oblongus, cylindricus, subnitidus, parce longius pilosus, ferrugineo-piceus; prothorace oblongo, versus apicem fortiter excavato sulcato, margine apicali in corniculum validum producto, supra anterius exasperato, posterius disperse punctato; elytris ad apicem oblique et convexe declivibus, declivitate infra marginata, supra lineato-punctatis, interstitiis rarius uniseriatim punctatis, 1o et 3o in declivitate tuberculatis. Long. 3·5 mm.

One specimen near Nagasaki.

Oblong, cylindrical, shining, deep ferruginous-brown, pubescence thin and long. Head completely hidden in front and below by

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prothorax, antennæ ferruginous. Prothorax longer than broad, subtruncate at base with posterior angles rounded, sides slightly rounded, apical angles strongly rounded, apex transverse but produced in middle into a strong triangular spine directed forwards and upwards, anterior opening of prothorax horizontal, slightly produced downwards below spine; surface convex, with a median obtusely pointed elevation, in front of which is a deep triangular impression reaching apical spine, its anterior half very finely asperate, its posterior half with distinct scattered punctuation. Scutellum very small, triangular. Elytra narrower than prothorax and one-third longer, separately convex at base with margin elevated, humeral prominences obsolete, sides subparallel to apex, which is broadly rounded; surface nearly cylindrical, declivous and convex at apex, the declivity finely carinate below for a short distance, with rows of fine punctures; interstices flat, subrugose, with a single row of remote piliferous punctures, on declivity more distinctly and transversely rugose, 1st and 3rd with four or five fine tubercles, 2nd with traces of two tubercles on summit only. Legs ferruginous, tibiæ strongly dilated and serrate.

This insect is the male of a species in Eichhoff's section + + to which *Xyleborus obliquecauda*, Mots., *X. aquilus*, M., and *X. validus*, Eichh., belong. It is most like the last species, but does not resemble it very closely, and may be the male of a species of which Mr. Lewis has not taken the female.

Trypodendron, Steph.

There are at present two Japanese species, one of which is merely a geographical variety of the European *Trypodendron quercus*, Eichh.

Trypodendron quercus, Eichh., var. *niponicum*.

Majus, prothorace pro maxima parte nigro, plaga basali testacea, elytrorum lateribus ad versuram apicalem angulatis, subproductis, apice utrinque distincte sinuato. Long. 3·6—4 mm.

A dozen examples taken at Miyanoshita, and one at Oyayama.

The black patches on the thorax and the elytral vittæ are of the same shape as in the type, but better marked, the thorax being suffused as a rule with black except at the base, and the elytral vittæ reaching the base in all mature specimens. The most distinct character is the prominence of the angle of junction between the sides of

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the elytra, and the apical margin which is thereby sinuate at the sides. This feature, though not usual in European examples, is distinctly traceable in a less degree in one specimen of my series from the Ardennes, and is therefore not specific. I do not think that the identification of this species with Fabricius' *Apate signata* is proved.

Trypodendron pubipenne, sp. n.

Oblongum, subnitidum, pilis longis adspersum, fusco-nigrum, elytris testaceis, sutura et apice infuscatis, antennis pedibusque testaceis; clava antennarum ovali, haud acuminata; prothorace obscuro, anterius exasperato, posterius in medio subtilissime aciculato-punctato, lateribus muticis; elytris apice obtuso, vix perspicue lineato-punctatis, interstitiis subrugulosis, multipunctatis.

Mas. Capite angusto, fronte depressa, supra inter partes oculorum superiores carinula transversa nitida ornata; prothorace anterius fortiter angustato.

Fem. Capite lato, fronte subconvexa; prothorace minus angustato. Long. 3 mm.

Four specimens taken at Sapporo, Kiga, Miyanoshita, and Ichiuchi.

Oblong, fuscous-black with elytra dull testaceous, darker along suture and at apex, moderately shining, with long downy pubescence. Head in male narrow with front flattened, longitudinally impressed, dull, sparsely punctured and pubescent, upper divisions of eyes with a narrow raised glossy margin continued as a transverse grooved ridge across vertex; in female broader, subconvex, transversely rugose, scantily punctured and hairy. Antennæ with club oval, not acuminate, completely pubescent. Prothorax transverse, strongly constricted in front in male, less so in female, its sides rounded, apical margin bituberculate, acuminate in male, the whole surface dull with very fine granulations, gibbous in female, depressed in male, with scattered hairs, absent over sides of base, in front with asperate tubercles, becoming finer and produced in middle nearly to base, which is without aciculations at sides. Scutellum piceous, triangular, pubescent. Elytra less than twice as long as prothorax and narrower than its greatest width, sides subparallel, apex obtusely rounded, surface with long pubescence chiefly at sides and apex, finely punctured in rows, interstices multi-punctate, subrugose, the punctures as in the allied species not readily distinguishable from those of the striæ. Underside fuscous-black, almost impunctate, pubescent.

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In the weakness of the elytral striæ and the length of the pubescence this species is allied to *Trypodendron politum*, Say (*unicolor*, Eichh.), from N. America, which I have not seen. It has no trace of a suture on the antennal club, nor is it especially narrow, both points being characteristic of *T. politum* (Lec. *Rhync.* N. Am., pp. 357, 358). It differs from Eichhoff's description of *T. unicolor*, in being not elongate, in the absence of a transverse elevated line on the prothorax, which is constricted in front, and in the elytra being not unicolorous.

SCOLYTO-PLATYPINI.

Scolyto-platypus, Schauf.

Scolyto-platypus tycon, m.
" " *daimio*, m.
" " *siomio*, m.
" " *mikado*, m.

I have nothing to add to my account of these insects (Trans. Ent. Soc. Lond., 1893, pp. 425—442).

The following species is new, and should be placed after *S. tycon*.

Scolyto-platypus shogun, sp. n.

Oblongo-cylindricus, fere glaber, niger vel piceus, antennis pedibusque ferrugineo-piceis; prothorace transverso, subopaco, parce et subtiliter punctulato; elytris ante declivitatem haud striatis irregulariter punctatis, declivitate striata, interstitiis convexis seriatim tuberculatis. Long. 3·5 mm.

Mas. Fronte excavata, opaca, pilis fulvis ciliatis circumdata, antennarum scapo fortiter clavato, funiculo brevi, flexili, clava elongata acuminata, ad apicem ciliata.

Several examples, probably taken at Higo.

Intermediate between *S. tycon* and *daimio*, and closely resembling dark specimens of the former in shape and size, but the elytra show no trace of striæ and are not pubescent at the apex. Male with head deeply excavate, dull with a thick marginal fringe of coarse hairs, antennæ

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constructed as in *S. daimio* ♂, but with the club elongate and pointed. Female with antennal club a little more elongate than in *S. tycon* ♀. Elytra with the sutural stria alone faintly expressed in the male, declivity with 1st and 3rd interstices tuberculate throughout, the remainder more finely at the upper angle. Prothoracic foveæ of male distinct. Anterior tarsal joints trigonate.

The male has the prosternum prominent in the middle, the prominence corresponding to a wide deep anterior "pocket"; the anterior margin of the prosternum is constructed similarly to that of *S. mikado* ♂, but the two hooks are replaced by a transverse chitinous plate, the anterior angles of which are acute and prominent.

PLATYPINI.

One of the most admirable features of Chapuis' "Monographie des Platypides," upon which our knowledge of this sub-family is almost entirely based, is the ability, almost to be called intuition, with which he has grouped forms, often widely different in appearance, as the respective sexes of the species which he described; and an examination of his own collection, or of any other containing species named by him, affords proof that his judgment was in the main correct, which is remarkable, if it be remembered that he had to reduce to order a vast and heterogeneous mass of material from all parts of the world. For he raised the number of species from 15 (excluding a few unrecognized forms) to 202; and entomologists have been so far content to accept his work as final, that since the publication of his "Monographie" they have added but six species to those therein described. But, identification of two forms as the respective sexes of a single species is obviously quite compatible with error as regards the reference of them to their proper sexes, and it is a matter of common opinion among entomologists that he has, throughout the work, reversed the sexes and called the male the female and *vice-versa*. This was first suggested to me by the late Mr. Janson; it has not been, to my knowledge, explicitly stated in print, but Eichhoff has indicated a

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doubt as to the correct interpretation of the sexes by Chapuis ("Die eur. Borkenk.," p. 306, note). M. Bedel ("Coléop. du bassin de la Seine," vi., p. 404) inverts the sexes of *P. cylindrus*, as given by Chapuis, though without comment; he has kindly informed me that he was led by Eichhoff's expression of doubt to dissect dried examples of *P. cylindrus*, which led him to the conclusion that Chapuis was wrong. Now Chapuis was probably guided by the generalisation of Perris, since disproved for the *Tomicini* by Lindeman and Eichhoff, that in the *Scolytidæ* a greater development of the elytral armature was a female characteristic, and by the sexual features of certain species of *Crossotarsus*, in which the antennæ have the scape remarkably developed in the sex that he indicates as the male. This antennal development, together with the deeply excavate and fringed front in the same sex of some species, and the more developed legs of the opposite sex (in *Crossotarsus*), which agree with the sexual features of the *Scolyto-platypini*, are not easily reconciled with the usual sexual characters, if the sexes are reversed; but the opposite may be said of the constantly stronger elytral armature of the females (Chap.), and their occasional possession of abdominal armature (*Crossotarsi genuini*, *Platypus blanchardi*) or of a concave and short abdomen (*Crossotarsi*). It is obvious that external sexual characters are not constant among the *Scolytidæ*, and that little dependence can be placed on them. The question can only be decided by direct examination of the generative organs. Like M. Bedel, I have examined them in dried specimens of *P. cylindrus*, and also of *Crossotarsus wallacei*. This examination has given results which leave me little doubt in the matter; but it so difficult, in these cases, to correctly interpret the structures exhibited in dried specimens, that I do not feel justified at present in publishing my conclusions. I can, however, say that the sexes of those two species, as given by Chapuis, correspond, and there is no evidence of his having indicated them rightly in some genera and erroneously in others. He is entirely right or entirely wrong. For the present, therefore, I prefer to describe the sexes in accordance with Chapuis, as a matter of convenience solely, and without implying acquiescence in his views.

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This will cause no confusion, and the same cannot be said of a readjustment of the sexual characters which should eventually be proved to be itself erroneous.

The question can be settled beyond dispute by the dissection of fresh examples; and if I can obtain them I hope to solve it in that way.

Crossotarsus, Chap.

This Oriental genus is represented by three species.

Crossotarsus chapuisi, sp. n.

Fem. Sub-elongata, picea, nitidissima; capite dense ac rugose punctato; prothorace irregulariter punctato, punctis ante sulcum et versus basim crebrioribus; elytris striato-punctatis, interstitio 3o ad basim dilatato, laevi, ad apicem subangustatis, leniter declivibus, apice pilis aureis ciliato, supra depressionem posticam angustam sublinearem producto, angulo externo vix perspicue elongato; abdominis segmento apicali fortiter excavato-impresso; tibiis posticis dilatatis ad apicem in lobos productis. Long. 8 mm.

One specimen, Higo.

More elongate than the majority of the genus, shining piceous, smooth and regularly cylindrical. Head with front subquadrate, very closely and rugosely punctured, the punctures longitudinal, with an indistinct median depression, vertex with three shining longitudinal vittæ separated by punctured spaces, eyes rather large and prominent, subcircular, antennæ with scape enlarged towards the base or inner side, but not produced, funiculus inserted at apex of scape. Prothorax oblong, not strongly emarginate, posterior angles of emargination rather prominent, median sulcus fine, surrounded by a smooth cordate area; punctures longitudinally oval, sparse over apical half, closer at base and over a patch in front of sulcus, lateral margin with two or three deep asymmetrical pore-like punctures behind middle. Scutellum indistinguishable. Elytra double as long as prothorax, with sides narrowed and slightly constricted at apex; striate, the striæ with an irregular single row of punctures grouped in pairs, 3rd and 4th conjoined at base, interstices smooth, flat, with very fine irregular punctures, 3rd dilated at base with a few stronger punctures; gently depressed towards apex, with the striæ at first deeper and then obliterated before posterior margin, interstitial punctuation

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stronger, suture longitudinally impressed before apex; posterior margin gently rounded and fringed with aureous pubescence which conceals the very shortly produced apical angles; posterior impression narrow, sublinear, concave, hidden by apical margin. Underside ferruginous, with scanty pubescence, abdomen concave, not strongly punctured, sides of 2nd and 4th segments scarcely produced, last segment with a large deep transversely oval impression, bordered in front by a fringe of aureous hairs, and reaching the prominent apical margin. Anterior tibiæ with five carinæ, and indistinct traces of others at base; intermediate tibiæ with a single carina on anterior surface; posterior tibiæ dilated, with outer border convex, and apex produced into two serrate lobes on either side of tarsal articulation, densely ciliate, with yellowish hairs. Posterior coxæ with a prominent free margin to inner and apical borders, which with the posterior margin of the trochanter is sharply serrate.

I cannot refer this fine and distinct species to any of Chapuis' groups. I therefore propose for it a distinct group, *Crossotarsi mutici*, characterized in the female by the gently declivous elytra, without elevated interstices or conspicuously produced apical angles, and with a narrow deep posterior impression, in which it approaches *C. minax*, Walk. The structure of the posterior tibiæ, and the abdomen, together with the absence of a distinct scutellum, are also characteristic features. The specimen is undoubtedly a female—in the conventional sense.

Crossotarsus niponicus, sp. n.

Ferrugineus, elytris in medio paullo dilutioribus, postice infuscatis; prothorace subquadrato, irregulariter punctato, punctis ad basim haud profundioribus; elytris lineato-punctatis, stria suturali per totum, ceteris modo ad basim apicemque impressis, apice convexe declivi, angulis externis productis, depressione angusta; abdominis segmento primo spinula obliqua armato.

Mas. Interstitiis elytrorum in declivitate non elevatis, ad basim granulatis, angulis externis brevius productis, abdominis spinula brevi. Long. 6—6·5 mm.

Fem. Interstitiis in declivitate subelevatis, striis subsulcatis, spinula abdominis longa, segmento 5o subconcavo. Long. 5·7—6·2 mm.

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Generally distributed; numerous specimens taken at Sapporo and Hakodate in Yezo, also at Miyanoshita, Yuyama, etc., and in Kiushiu.

Lighter or darker ferruginous-brown, with head and apical third of elytra infuscate; the elytra sometimes evidently lighter in the middle, particularly in the males. Head with front flattened, dull, with longitudinal strigose punctures which are stronger in the female, and with a longitudinal impressed line, nearly obsolete in the male, vertex with three shining vittæ; antennæ with scape simple, slightly dilated internally at base. Prothorax subquadrate, its central furrow shallow; in the female with the sides of the furrow slightly elevated, with irregular punctures, the punctures closer and rather deeper towards sides behind emargination, internal to which there is a shallow depression; in the female without sides of sulcus elevated, with fine irregular punctures, usually rather closer on two slight impressions on either side of anterior extremity of sulcus, one or two impressions along lateral margin are usually present but not constant. Elytra longer in the male than in the female, in both sexes with rows of fine punctures, first stria impressed throughout, more strongly at base, the rest impressed at base and on declivity, 3rd and 4th conjoined at base; interstices with a very fine groundwork of punctures, and one or two larger punctures, 3rd finely granulate at base in male; apex gently declivous with external angles produced more strongly in female, striæ of male impressed but not dilated, interstices flat, pubescent, striæ dilated in female, subsulcate, interstices pubescent, convex; marginal impression narrow, shining, tuberculate at extremities of 3rd and 4th interstices. Underside ferruginous, 1st abdominal segment with an oblique spine, long in female, tuberculiform in male, apical segment strongly punctured in female and concave. Legs ferruginous.

This species belongs to the *Crossotarsi subdepressi*, and is closely allied to *C. fairmairei*, Chap., from which it can be separated by the absence of the close variolose punctures at the base of the prothorax, and by the second interstice of the elytra not being impressed in the middle. The produced angles of the elytra are longer, and extend more obliquely backwards than in *C. fairmairei*.

Crossotarsus contaminatus, sp. n.

Fem. Picea, fronte subconcava, opaca, disperse punctata; prothorace oblongiusculo, in medio utrinque impresso, irregulariter

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punctato, ante sulcum congerie punctorum confluentium notato; elytris subtiliter striato-punctitis, striis ad basim impressis, interstitiis laevibus, rarius subtiliter punctulatis, ad apicem subdeclivibus, angulis externis subtus productis, interstitiis variolose punctatis, pilosis, depressione postice angusta, lunata; abdominis segmentis inermibus, 5o subconcavo. Long. 5·3 mm.

One example, Higo; three without locality.

Piceous; head with front subconcave, shortly pubescent, dull with scattered punctuation, more strongly over mouth, the punctures elongate towards vertex, and with a median impressed line, vertex with a median shining line and two indistinct lateral lines, antennæ with scape simple, linear. Prothorax longer than broad, its lateral emargination very feeble, slightly impressed on either side at middle of surface, sulcus very fine, not reaching base, and terminated in front by an irregular patch of coalesced shallow punctures, punctuation of rest of surface scattered, irregular, stronger in front and on either side of a median smooth line running from central patch to apex. Elytra shining, finely striato-punctate, the striæ wider and deeper at base, 3rd and 4th not conjoined, sutural stria impressed throughout, interstices scarcely convex, with a few fine scattered punctures, rather closer at base, without reticulate or punctured ground; apical extremity rounded and declivous, with interstices coarsely and rugosely punctured and pilose, not carinate, the punctuation of the 1st not extending farther forwards than that of succeeding interstices, external angles produced downwards in the plane of the terminal depression, which is narrow, lunate and subconcave, forming a marked angle with the surface of the elytra. Underside deep ferruginous, with metasternum and abdomen piceous, middle of former and latter strongly punctured; abdominal segments unarmed, 2nd and 4th narrowly produced at sides, 5th concave. Legs piceous. Posterior coxæ with a spine at internal angle; posterior femora not crenate below.

This species must, I think, be placed with the *Crossotarsi subdepressi*, though the interstices are not carinate at the apex of the elytra, and the marginal impression is more sharply separated from the surface than is usual in that group. It can be distinguished from *C. niponicus* by the absence of a spine on the first abdominal segment, and by the 3rd and 4th elytral striæ not meeting at base, so as to shorten the 4th interstice.

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Platypus, Hbst.

The five species in this collection are all new; the males of two alone are represented.

Table.

1. Elytra with impressed striæ 2
   with rows of fine punctures 5
2. Apex of elytra with a small terminal impression, unarmed . 3
   declivous and convex, with two small tubercles on declivity . . . *modestus*, ♀
   produced at external angles 4
3. Prothorax quadrate, with a narrow patch of close punctures round sulcus, the anterior two or three large and porelike, elytra pilose from base to apex *modestus*, ♂
   oblong, with a broad cordate patch of uniform punctures round sulcus, elytra glabrous before apex . . . . . *lewisi*, ♂
4. Interstices spined at summit of apical declivity of elytra; 4th abdominal segment with two spines . . *lewisi*, ♀
   Interstices not spined, 4th abdominal segment unarmed *severini*, ♀
5. Terminal impression oval, with an inferior emargination not reaching middle . . . . *calamus*, ♀
   lunate, emarginate to middle . *hamatus*, ♀

Platypus modestus, sp. n.

Ferrugineus, prothorace subquadrato, sparsim piloso; elytris sulcatis, sulcis postice latioribus, interstitiis subconvexis, nitidis, rarius pilosis; apice convexe declivi, interstitiis opacis, granulatis, pube densiore vestitis. Long. 5 mm.

Mas. Fronte valde concava, opaca, fundo bifoveolato; prothoracis sulco congerie punctorum circumdato, punctis inaequalibus, depressione elytrorum postica parva, subtriangulari, granulata.

Fem. Fronte quam minime concava, opaca; prothorace medio utrinque impresso, subaequaliter punctato, punctis in utroque sulci latere paullo crebrioribus; declivitate ad apicem interstitii 3i spinula ornata.

Four specimens, Nikko and Shimidzu Toge.

Rather robust and not elongate; ferruginous, with head and apex of elytra darker, the latter nearly testaceous at base.

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MALE, with front of head rather deeply concave, its surface closely granulate, slightly shining in parts, with a fine central impressed line and a circular fovea on either side ; vertex convex, with a shining central and two indistinct lateral vittæ. Prothorax subquadrate, median sulcus with a narrow patch of punctures on either side, the front half of each patch formed of the usual close small punctures, except for the two anterior punctures, which are larger and almost porelike, and those of the posterior half, which are larger, shallow, and less numerous ; remainder of surface rather regularly punctured and thinly pubescent. Elytra sulcate, the sulci punctured throughout, becoming a little wider towards apex, interstices convex, shining, very finely punctured and pubescent, 3rd and 5th closely granulate at base, 2nd and 4th abbreviated at base with a few small granules ; apical extremity convex, the sulci shallower, interstices granulate, more thickly pilose, posterior impression small and not well marked, subtriangular, irregularly granulate.

FEMALE, with front very slightly concave, quite dull, very finely punctured above, with short median impressed line, vertex with median vitta alone shining. Prothorax subquadrate with an impression on either side about middle, nearly uniformly punctured, the punctures rather closer at sides of sulcus. Elytra with surface sculptured as in male, but with the sulci wider behind middle and their punctures coalesced ; all interstices granulate for a short distance at base ; apical extremity convex, the striæ ceasing before posterior margin, interstices dull, granulate and pilose, apex of 3rd marked by a small pointed tubercle.

Underside and legs testaceous or ferruginous, abdomen more convex in the male.

One pair is rather darker, and the surface of the thorax and elytra are hairless before the apex. This is, however, due to the specimens being more mature and having been rubbed. The species belongs to the *Platypi sulcati,* and is not unlike *P. jansoni,* Chap., but the prothorax is shorter and the elytral interstices are less elevated, and are not spined at the margin of the apical declivity.

Platypus lewisi, sp. n.

Ferrugineo-piceus, prothorace oblongo, elytris sulcatis, interstitiis convexis, glabris, nitidis. Long. 5·5 mm.

MAS. Fronte plana, opaca, prothoracis sulco congerie punctorum magna, cordiformi, circumdato, elytrorum interstitiis subsimilibus,

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ad apicem, 3o et 5o etiam ad basim granulatis, depressione postica parva, subtriangulari, granulata.

FEM. Fronte antice subconcava, opaca, prothoracis sulco congerie punctorum minore ovali circumdato, interstitiis 1o et 2o in summa declivitate in spinam communem magnam, 3o, 5o, 7o in spinulas parvas productis, declivitate utrinque tuberculata, angulis externis in lobos subquadratos productis, abdominis segmento 4o bispinato.

Five specimens, Miyanoshita, Kiga, and Yuyama.

Elongate, ferruginous, or inclining to pitchy.

MALE with front of head flat, dull with very fine cross reticulation, punctures rather fine, longitudinally strigose towards mouth. Prothorax oblong, diffusely punctured, rather closer at extreme sides, with a porelike puncture within anterior angle of emargination and a broad cordate group of small uniform punctures round median sulcus. Elytra sulcate, the sulci with irregular confluent punctures, not widened behind and obliterated before apical impression; interstices convex, shining, with fine scattered oblong punctures, 1st narrow throughout, bases of 2nd and 4th abbreviated, impressed and more strongly punctured, the latter with two or three longitudinal asperities, bases of 3rd and 5th elevated with transverse granulations; apical extremity with interstices dull, granulate, and pilose, terminal impression subtriangular, closely granulate, with erect hairs, suture shining. Underside reddish testaceous, abdomen unarmed.

FEMALE with head similar to male in sculpture, front impressed over mouth and subconvex behind. Prothorax oblong, slightly impressed in middle of either side, sulcus surrounded with an oval patch of punctuation narrower than in male, rest of punctures scattered and rather fine, except along lateral border. Elytra sulcate, the sulci wider behind with punctures confluent, interstices convex, shining, with fine scattered oblong punctures, the 1st narrow throughout, base of 3rd enlarged, more closely punctured, bases of 2nd and 4th impressed, punctured, and asperate as in male, two first with a large common spine, 3rd, 5th, and 7th with small spines at summit of apical declivity, the rest unarmed; declivity convex with the sulci continued on it, and the interstices finely asperate, the third terminating at a stout tubercle, external angles produced backwards into a vertical subquadrate lobe, with its posterior edge concave, so as to form two blunt teeth at angles. Fourth abdominal segment armed with two spines, the fifth flattened.

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This species is allied in its main features to the *Platypi sulcati*, with which I must associate it. It differs from the other described species in the strongly produced external apical angles of the elytra, which are not triquetrous as in the *P. trispinati*. The female shares with *P. quadridentatus*, Ol. (*blanchardi*, Chap.), the peculiarity of possessing two spines on the fourth abdominal segment, but is much larger and easily distinguished by the group of punctures on the thorax. The male is separable from that of *P. modestus* by its larger size, flat forehead, and oblong thorax; the elytra are quite glabrous before the apical extremity.

Platypus severini, sp. n.

Fem. Piceo-ferruginea, elytris postice infuscatis; fronte subconcava, rugosa; prothorace paullo longiore quam latiore, utrinque ad medium vitta obliqua subelevata, antice rarius irregulariter, postice crebrius punctato; elytris ad apicem subdeclivibus et in processus divaricatos attenuatis, striato-punctatis, striis impressis, interstitiis subconvexis ad apicem pilosis, duobus primis per totum, ceteris ad basim subtiliter punctulatis, processibus desuper aspectis bidentatis. Long. 5—5·3 mm.

Numerous examples of one sex only, taken from beech at Nikko, Chiuzenji, and Hakodate.

Deep ferruginous brown, with elytra darker towards apex. Head with front subconcave, covered with close shallow rugose punctuation, rather smoother towards mouth, vertex rather abruptly separate from front, with three smooth vittæ, interspaces coarsely punctured. Prothorax a little longer than broad, median sulcus fine but sharply marked, surface with very fine reticulation, and an indistinct oblique elevation at either side of anterior extremity of sulcus, punctures of anterior half scattered, and absent over middle line, of posterior half closer, shallow, and longitudinally oval. Elytra declivous towards apex and produced into two divergent processes, with subsulcate striæ, which are wider and shallower towards apex, with the punctures fused; interstices convex, finely reticulate and punctured at base, the first and second with a single row of punctures along inner border, all interstices flatter towards apex, inconspicuously tuberculate, and with serrate hairs; apical processes declivous in the plane of the posterior termination, produced outwards to form an obtuse oval emargination at apex,

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their upper border curved and continuous with second interstice, extremity two-spined when seen from above, inner spine longer and truncate. Last abdominal segment subconvex, rugosely punctured.

The species belongs to the *Platypi oxyuri*, and may be distinguished from the Pyrenean *P. oxyurus*, Dup., by the thoracic sculpture, and by the processes of the elytra being two-spined when seen from above instead of from the side, as in the latter species. From *P. solidus*, Walk., the divergence of these processes will at once separate it, as will its larger size, and the convex interstices which, except the first two, are impunctate after the base.

Platypus calamus, sp. n.

Fem. Elongata, angusta, ferrugineo-testacea, elytris apice infuscatis; fronte concava, linea media impressa; prothorace sesqui longiore quam latiore, in utroque sulci latere plaga punctorum angusta; elytris lineato-punctatis postice haud declivibus, interstitiis planis, vix perspicue punctatis, apice oblique excavato-impresso, ovali, inferne emarginato, angulis externis oblique productis, margine externo elevato sinuato, ad suturam supra valde obliquo, depressione nitida, ante angulos extremos impressa. Long. 3·7 mm.

Sixteen examples of one sex only, taken at various places, Miyanoshita, Oshima, Kiushiu (Higo, Yuyama, etc.).

Slender, reddish testaceous, elytra with apex darker. Head with front concave, anteriorly dull, with a deep longitudinal impressed line in middle, above it, with rather strong scattered punctures, upper part forming an obtuse angle with vertex, which has only the median elevated line present, narrow and infuscate. Prothorax one half longer than broad, the sulcus fine, with a narrow group of punctures on either side, closer anteriorly, remainder of surface irregularly punctured, the punctures more evident towards the base, anterior and posterior borders with fine transverse reticulation. Elytra finely punctured in lines, sutural stria impressed throughout, remainder at base only; interstices with a few fine punctures, 1st, 3rd, and 5th elevated at base, the former impressed with a fine line beginning behind base, 2nd and 4th with base evidently punctured. Apex of elytra with an oblique terminal impressed surface, its margin elevated and slightly everted, curving

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away from suture so as to form an angle with its fellow above the terminal impression, and then sinuate at sides; external angles produced in a curve downwards and backwards, their outer border serrate; impressed surface very shining, elevated at suture, and concave above external angles, its outline an incomplete oval, emarginate below, the emargination deeper than wide, but shorter than the terminal surface measured along the suture, its sides nearly straight, not toothed, and apex rounded. Last abdominal segment concave.

This species is one of the *Platypi cupulati*, and can be separated from all described species except the following, by the fact that in them the suture is notched or narrowly emarginate above the terminal impression, and the sutural border forms a sharp and distinct angle with the upper margin of the impression, whereas in these species the sutural margin is gradually rounded into that of the impression without trace of any angle, so as to form a wide emargination. It can also be separated from most by the absence of any trace of a tooth on the lower apical emargination.

Platypus hamatus, sp. n.

Fem. Elongata, ferrugineo-testacea, elytris apice paullo obscurioribus; fronte impressa, in medio foveolata; prothorace oblongo, punctis magnis et parvis irregulariter notato, parte antica sulci utrinque punctis paucis circumdata; elytris lineato-punctatis, interstitiis planis, parcissime punctatis, apice excavato-impresso, lunato, inferne late emarginato, angulis extremis longe productis, margine supra depressionem intus ad suturam curvato, convexo. Long. 4·2 mm.

Two examples at Yuyama and Miyanoshita.

Elongate, reddish testaceous, with elytra darker at apex. Head with front subconcave, foveolate in middle, finely reticulate, and rather coarsely punctate above, vertex strongly punctured with a fine median elevated infuscate line. Prothorax more elongate than in *P. calamus*, sulcus deeper at extremities than in middle, with about a dozen punctures on either side of anterior extremity, remainder of surface with irregular punctures of two sizes, a slight impression on either side, about middle more closely punctured, anterior and posterior borders finely reticulate. Elytra with sculpture of surface similar to that of *P. calamus*, terminating in a vertical impressed surface, which is lunate and widely

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emarginate below, lateral borders meeting obliquely at suture above impression, and curved out as in *P. calamus*, and then sinuate, external angles produced downwards and backwards, longer and more curved than in the latter species; terminal impression emarginate almost to middle, the emargination broader than long, with inferior sutural angles very slightly produced, its surface shining, foveolate on either side, with suture elevated and tuberculate. Last abdominal segment concave.

This species, also one of the *Platypi cupulati*, is best separated from *P. calamus* by the structure of the apical impression, the length of which measured along the suture is about equal to the depth of the emargination, whereas in *P. calamus* it is about double its depth. The tubercles along the suture, the minutely produced sutural angles at the fundus of the interior emargination, and a fine serration of the superior border, where it curves away from the suture, are peculiar to this species. *P. hamatus* is evidently closely allied to *P. forficula*, Chap., of which I have been unable to see a typical specimen. I have, however, an unnamed *Platypus*, taken by Mr. Wallace in Gilolo, which agrees with the description of *P. forficula*, and is probably to be referred to that species, as Chapuis appears to have seen all Wallace's *Platypini*. It most closely resembles *P. hamatus*, but the sutural border of the elytra makes a sharp angle with the upper margin of the terminal impression, which is much narrower than in the latter species, being not half as deep as the inferior emargination.

Diapus, Chap.

An Oriental genus, represented in Japan by one species.

Diapus aculeatus, sp. n.

Fem. Picea, margine prothoracis postico et elytris ad basim dilutioribus; fronte deplanata, in medio breviter carinata; prothoracis disco nitidissimo, basi fortiter punctata; elytrorum interstitiis 1o, 2o, 3o elevatis, 3o, 5o ad apicem in spinulas validas productis; 7o breviter spinoso, extus cum 8o et 9o serratis conjuncto, angulo externo in spinulam obliquam angustissimam producto, depressione postica breviter bispinata. Long. 2·8 mm.

Two examples, Higo.

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Rather slender and very shining, head and prothorax deep piceous, the latter with basal border narrowly fusco-testaceous, elytra fusco-testaceous at base, becoming pitchy towards apex. Head with front nearly flat, impressed slightly over mouth, dull, with rather distinct and strigose punctuation below, the punctures less apparent towards vertex, in the middle with a short median elevated keel, which is not perceptible towards vertex; elevated lines of the latter very evident and shining. Prothorax very shining, rather deeply emarginate at sides, apex with a row of piliferous punctures, rest of surface quite impunctate, except at base which is closely and strongly punctured. Elytra with first two striæ and marginal stria impressed throughout, third and fourth at base only, outer striæ indicated by lines of irregular punctures, which coalesce towards apex, interspaces almost impunctate; 1st interstice with a minute spine at apex, 3rd and 5th with two long spines, 7th with a shorter spine, the outer border of which is conjoined with two serrations formed by the extremities of the succeeding interstices, external angle with a very slender spine directed obliquely downwards, apex fringed with a few long ciliate hairs, apical impression oblique, subconvex, with two spines shorter than the three long spines of the interstices. Underside testaceous, metasternum and abdomen piceous, last segment of the latter nearly flat, dull, fringed with long curled cilia.

This species is closely allied to *D. quinque-spinatus*, Chap., of which it may be the Japanese form. It presents the following distinctive features: the colour is deeper and the surface more shining, the frontal carina is shorter, nearer the mouth, and not traceable towards the vertex as in *D. quinque-spinatus*, in which it appears to be longer and interrupted; the prothorax is quite impunctate except at the apex and base, and the basal punctures are more numerous; the interstices of the elytra are scarcely punctured, the spine of the 7th interstice is shorter and that of the 9th only represented by a small tooth, the spine at the external apical angle is peculiar to this species, as is the terminal fringe of hairs; the spines of the posterior depression are also shorter.

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(*Genus incertæ sedis.*)

GENYOCERUS, Motsch.

Etud. ent. vii., p. 68.

G. adustipennis, Motsch., *l.c.* ix., p. 19.

Whatever this insect may be, it cannot be a *Scolytoplatypus*, **as** it is described in these terms: *Figura* **Platypi cylindri**, *sed glabrior*, etc.

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V. *Description of the female of* Hypochrysops scintillans, *Butl.* By Hamilton H. Druce, F.Z.S.

[Read Feb. 7th, 1894.]

We have lately procured a fine pair of this species; the ♂ only of which has been described, and as the ♀ presents considerable differences I have written the following description. They were received from Mioko, New Ireland, the ♂ agreeing with the type in the National Museum from New Britain.

Hypochrysops scintillans.

Miletus scintillans, Butl., Ann. and Mag. Nat. Hist. (5), x, p. 150 (1882).

Hypochrysops scintillans, H. H. Druce, Trans. Ent. Soc. Lond. (1890), p. 191.

♀. Upperside brown with a creamy-white central patch on forewing; no trace of blue. Forewing rich dark brown, with a disc of creamy-white arranged much as the blue in *H. crateras* ♀, and extending from the base to beyond the cell, lightest in colour towards the centre of the wing, and becoming gradually submerged in the brown borders, the inner margin being lighter brown than the rest of the wing. Hindwing brown, considerably paler than the forewing, darker along the subcostal nervure to the base of the subcostal nervule, where it becomes somewhat suffused; the median nervure from about its middle, and the two median nervules from their bases, distinctly and evenly yellow. Costal margin from base nearly to apex pale creamy-white. Upper half of anal fold greyish, lower concolorous with wings. Cilia of both wings brown, that of hindwing being rather darker than ground colour. Underside much as in ♂, but the median space of forewing (bordered by the lower wall of the cell and the subapical red band) creamy-white in place of greyish-brown; the red bands of the hindwing being somewhat wider, and their metallic borders scarcely so brilliant. Thorax and abdomen brown; head dark brown, with a whitish frontal line, and a yellow inner border to the eye; legs and palpi yellow. Antennæ black, white spotted below, yellow tipped. Expanse, ♀ $1\frac{3}{16}$ in., ♂ $1\frac{1}{2}$ in.

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Hab. Mioko, New Ireland (Mus. Druce).

In December 1890, I published, in the 'Transactions' of this Society, a short monograph of the genus, recognizing thirty-two species of these gorgeous little butterflies, and to that number must be added a new species, since described by Mr. Miskin in the "Anns. Queensl. Mus.," No. 1 (Supp.), p. 85 (1891), under the name *H. apollo*, from Herbert River, W. Queensland, and two other Australian species described by the same author in the "P. Z. S. N.S.W." (ser. 2) iii, pp. 1517 & 1518 (1888), viz.: *H. euclides* and *H. olliffi*; the former allied to *H. chrysanthis*, Feld., the two latter to *H. ignita*, Leach.

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VI. *A list of the Lepidoptera of the Khasia Hills.* Pt. II.

By Colonel Charles Swinhoe, M.A., F.L.S.

[Read Oct. 18th, 1893.]

Plate II.

HETEROCERA.

I.

In arranging the order in which the Heterocera should stand I have been working on the lines set forth in Mr. Hampson's excellent classification in Faun. Brit. Ind., but I cannot altogether follow the order in which he has, for the sake of convenience, put the different families, and prefer dividing them into three groups.

1st. Fore wing with vein 5 (lower radial) from centre of discocellulars, or nearer 6 than 4.

2nd. Fore wing with vein 5 from lower angle of cell, or nearer 4 than 6.

3rd. Fore wing with veins 4 to 11 arising from the cell at almost even distances apart.

Group I.

Sub Group 1.	No. 1.	*Sphingidæ*	-	Frenulum present.
„ 2.	„ 1.	*Saturniidæ*	-	Frenulum absent.
	„ 2.	*Brahmæidæ*	-	
	„ 3.	*Bombycidæ*	-	
„ 3.	„ 1.	*Eupterotidæ*	-	
„ 4.	„ 1.	*Notodontidæ*	-	Frenulum present.
	„ 2.	*Cymatophoridæ*		
„ 5.	„ 1.	*Epicopiidæ*	-	Frenulum rudimentary or absent.
	„ 2.	*Uraniidæ*	-	
	„ 3.	*Micronidæ*	-	
	„ 4.	*Epiplemidæ*	-	Frenulum present.
„ 6.	„ 1.	*Geometers*	-	Frenulum present.

Group II.

Sub Group 1.	No. 1.	*Callidulidæ*	-	Frenulum sometimes present sometimes absent.
	„ 2.	*Drepanulidæ*	-	

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Sub Group 1.	No. 3.	*Limacodidæ* -		
	„ 4.	*Lymantriidæ* -		
	„ 5.	*Hypsidæ* -	}	Frenulum present.
	„ 6.	*Arctiidæ* -		
	„ 7.	*Agaristidæ* -		
	„ 8.	*Castniidæ* -		
„ 2.	„ 1.	*Lasiocampidæ* -	}	Frenulum absent.
	„ 2.	*Pterothysanidæ*		
„ 3.	„ 1.	*Psychidæ* -	}	Frenulum present.
	„ 2.	*Cossidæ* - -		
„ 4.	„ 1.	*Arbelidæ* -	}	Frenulum absent.
	„ 2.	*Hepialidæ* -		
„ 5.	„ 1.	*Syntomidæ* -	}	Frenulum present.
	„ 2.	*Zygaenidæ* -		
„ 6.	„ 1.	*Noctuidæ* -		Frenulum present.
„ 7.	„ 1.	*Thyrididæ* -	}	Frenulum present.
	„ 2.	*Pyralidæ* -		

GROUP III.

Sub Group 1.	No. 1.	*Sesiidæ* - -	}	Frenulum present.
„ 2.	„ 1.	*Tineidæ* - -		

Group I.

Sub Group I.

Family SPHINGIDÆ.

Sub Family ACHERONTIINÆ.

Genus ACHERONTIA, Ochsen.

1. *A. styx*, Westw., Cab. Or. Ent., p. 88, pl. 42, fig. 3.

2. *A. lachesis* (Fabr.), Ent. Syst. Suppl., 434, 26, 27 (1798).
   A. morta, Hübn., Verz., p. 140 (1816).

Sub Fam. SMERINTHINÆ.

Genus LANGLIA, Moore.

3. *L. zeuzeroides*, Moore, P. Z. S., 1872, p. 567.
   L. khasiana, Moore, *l.c.*, p. 568.
   Recorded from the Khasias; not received by me.

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Sub Fam. AMBULYCINÆ.

Genus CALYMNIA, Walker.

4. *C. panopus* (Cram.), Pap. Exot., iii., p. 50, pl. 224, figs. A, B (1779).
Recorded from the Khasias.

Genus AMBULYX, Westw.

5. *A. substrigilis*, Westw., Cab. Or. Ent., p. 61, pl. 30, fig. 2 (1848).
Shillong and Cherra Punji.

6. *A. semifervens* (Walker), xxxi, p. 38 (1864).
A. turbata, Butler, P. Z. S., 1875, p. 252.
Cherra Punji.

7. *A. deucalion* (Walker), viii., p. 236 (1856).
Recorded from the Khasias.

8. *A. gigantea*, Rothschild, Nov. Zool., i., p. 96 (1894).
Recorded from the Khasias.

Sub Fam. CHÆROCAMPINÆ.

Genus ACOSMERYX, Boisd.

9. *A. sericeus* (Walker), viii., p. 181 (1856).
Many examples; Shillong.

10. *A. cinerea*, Butler, P. Z. S., 1875, p. 245.
Several examples; Shillong and Cherra Punji.

11. *A. naga*, Moore, Cat. Lep. E. I. C., i., p. 271 (1857).
Shillong and Cherra Punji. Out of the numerous specimens of this genus received there has not been a single typical *anceus*, Cram. Hampson has put these four very distinct species together; they appear to me to be very distinct, easily distinguishable and without intermediate forms.

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Genus Chærocampa, Dup.

12. *C. macromera*, Butler, P. Z. S., 1875, p. 7.
Shillong.

13. *C. alecto* (Linn.), Syst. Nat., i., p. 803 (1767).
Common.

14. *C. theylia* (Linn.), *l.c.*
C. rafflesii, Butler, Trans. Zool. Soc., 1876, p. 556.
Examples of both forms of this species.

15. *C. oldenlandiæ* (Fabr.), Sp. Ins., ii., p. 148 (1781).
Common.

16. *C. vagans* (Butler), Ill. Typ. Lep. Het. B. M., v., p. 4, pl. 78, fig. 7 (1881).
One example; Shillong.

17. *C. mydon* (Walker), viii., p. 155 (1856).
Three examples; Shillong.

18. *C. olivacea* (Moore), P. Z. S., 1872, p. 567.
Common.

19. *C. velata* (Walker), xxxv., p. 1853 (1866).
Pergesa aegrota, Butler, P. Z. S., 1875, p. 246.
Metopsilus albomarginatus, Rothschild, Nov. Zool., i., p. 78 (1894).
Shillong and Cherra Punji; in great numbers. Hampson has included *aurifera*, Butler, and *acuta*, Walker, with this species; they appear to me to be distinct; they have broad pale yellow prominent bands on each side of the thorax, a character wanting in *velata*. The form *albomarginatus* is not uncommon in the Khasias; I cannot see how it can be separated from *velata*: in this variable species there are scarcely any two examples identical.

20. *C. castor* (Walker), viii., 153 (1856).
Many examples, a common species in the Khasias; omitted by Hampson. I have it from both Shillong and Cherra Punji, it seems to be a link between *velata* and

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olivacea, having the colouration of the former with the white marginal suffusion on the fore wings above, of the latter.

21. *C. busiris* (Walker), viii., p. 158 (1856).

Panacra hamiltoni, Rothschild, Nov. Zool., i., p. 82.

Cherra Punji.

The type specimen is much faded, but I have a fine series and feel certain of my identification.

22. *C. helops* (Walker), viii., p. 180 (1856).

Philampelus orientalis, Felder, Reise Nov. Lep., pl. 77, fig. 1 (1874).

One example; Shillong. The type of *helops* is recorded from Port Natal, which must be a mistake.

23. *C. clotho* (Drury), Ill. Exot. Ins. ii., p. 48, pl. 28, fig. 1 (1773).

Sphinx butus, Cram., Pap. Exot., ii., p. 88, pl. 152 (1777).

Deilephila cyrene, Westw., Cab. Or. Ent., p. 13, pl. 6, fig. 1 (1848).

Many examples. The type of *cyrene* is in O. M.; it is identical with *clotho*.

24. *C. punctivenata*, Butler, P. Z. S., 1875, p. 248.

Many examples. I have both sexes from Cherra Punji. It should not be confounded with *clotho*. *Gonograpta* from Southern India also appears to be a good species. I have a long series in my Museum.

25. *C. lineosa*, Walker, viii., p. 144 (1856).

26. *C. major*, Butler, P. Z. S., 1875, p. 249.

27. *C. minor*, Butler, *l.c.*

Shillong and Cherra Punji; in great numbers. At first I put them together, following Hampson, but with the numbers now before me I cannot do so. They are undoubtedly somewhat alike, as are all the species of this group, but each has its own distinctive wing markings, and *major* has a pale yellowish broad longitudinal shade, central on forewings, discal on hindwings, which is very characteristic.

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28. *C. pallicosta*, Walker, viii., p. 145 (1856).
Three examples; Shillong.

Genus Daphnis, Hübn.

29. *D. nerii* (Linn.), Syst. Nat., i., 2, p. 798 (1767).
Recorded from Khasias.

30. *D. bhaga*, Moore, P. Z. S., 1865, p. 794.
Numerous specimens from Shillong and Cherra Punji.

Genus Theretra, Hübn.

31. *T. nessus* (Drury), Ill. Ins. Exot., ii., p. 46, pl. 27, fig. 1 (1773).
Shillong and Cherra Punji.

32. *T. actea* (Cram.), Pap. Exot., iii., p. 93, pl. 248, fig. A (1779).
Common.

Genus Elibia, Walker.

33. *E. dolichus* (Westw.), Cab. Or. Ent., p. 61, pl. 30, fig. 1 (1848).
Shillong and Cherra Punji.

Sub Fam. SPHINGINÆ.

Genus Protoparce, Burmeister.

34. *P. orientalis*, Butler, Trans. Zool. Soc. 1876, p. 609, pl. 91, figs. 16, 17 (larva).
Common.

Genus Pseudosphinx, Burmeister.

35. *P. inexacta* (Walker), viii., p. 208 (1856).
Many examples.

36. *P. fo* (Walker), viii., p. 195 (1856).
Shillong and Cherra Punji.

37. *P. discistriga* (Walker), viii., p. 209 (1856).
Common.

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38. *P. khasianum* (Rothschild), Nov. Zool., i., p. 90 (1894).

Recorded from the Khasias; must be closely allied to if distinct from the preceding which is a very variable species.

Genus NEPHELE, Hübner.

39. *N. hespera* (Fabr.), Syst. Ent., p. 546 (1775).

Recorded from the Khasias.

Genus APOCALYPSIS, Butler.

40. *A. velox*, Butler, Trans. Zool. Soc., 1876, p. 641.

One example; Shillong.

Genus PSEUDODOLBINA, Rothschild.

41. *P. veloxina*, Rothschild, Nov. Zool., i., p. 91, pl. 6, fig. 18 (1894).

Recorded from the Khasias.

Sub Fam. MACROGLOSSINÆ.

Genus GUERLCA, Kirby.

42. *G. hyas* (Walker), viii., p. 107, 1856.

Shillong.

43. *G. masuriensis* (Butler), P. Z. S., 1875, p. 244, pl. 3663.

Numerous specimens, the common form apparently. I have received it from both Shillong and Cherra Punji.

Genus RHOPALOPSYCHE, Butler.

44. *R. nycteris* (Kollar), Hüg. Kasch., iv., 2, p. 458, pl. 19, fig. 5 (1844).

Cherra Punji.

Genus MACROGLOSSA, Scop.

45. *M. belis* (Cram.), Pap. Exot., i., p. 147, pl. 94, fig. c (1776).

Common.

46. *M. gilia*, Herr Schüff., Samml. Ausser. Eur. Schm., pp. 59, 79, pl. 23, fig. 107 (1850).

Several examples.

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47. *M. proxima*, Butler, P. Z. S., 1875, p. 4, pl. 1, fig. 1.
Three examples; Shillong.

48. *M. imperator*, Butler, P. Z. S., 1875, p. 243, pl. 37, fig. 4.
Cherra Punji.

Genus Cephnodes, Hübn.

49. *C. hylas* (Linn.), Mant., i., p. 539 (1771).
Recorded from the Khasias.

Genus Sataspes, Moore.

50. *S. infernalis* (Westw.), Cab. Or. Ent., p. 61, pl. 30, fig. 3 (1848).
Common.

Sub Group II.

Fam. SATURNIIDÆ.

Genus Actias, Leach.

51. *A. selene* (Hübn.), Samml. Exot. Schm., i., pl. 172, fig. 3 (1806–19).
Common.

52. *A. mænas*, Double., Ann. Mag. N. H., xix., p. 95, pl. 7, fig. 1 (1847).
Common.

Genus Attacus, Linn.

53. *A. atlas*, Linn., Mus. Lud.-Ulr., p. 366 (1764).
Common.

54. *A. edwardsi*, White, P. Z. S., 1859, p. 115, pl. 57.
Shillong and Cherra Punji.

55. *A. cynthia*, Drury, Exot. Ins., ii., pl. 6, fig. 2 (1773).
Very plentiful.

56. *A. ricini*, Boisd., Ann. Soc. Ent. Fr. (3), ii., p. 755 (1854).
Many examples.

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Genus ANTHERÆA, Hübn.

57. *A. roylei*, Moore, P. Z. S., 1859, p. 256, pl. 64, fig. 1.
Cherra Punji.

58. *A. paphia* (Linn.), Syst. Nat., i., p. 809 (1767).
Cherra Punji.

59. *A. helferi*, Moore, P. Z. S., 1859, p. 257, pl. 64, fig. 2.
Cherra Punji.

60. *A. knyvetti*, Hampson, Faun. Brit. Ind. Moths, i., p. 19 (1892).
One female; Shillong.
This species has been in my collection for some years under Moore's M.S. name of *tumida*.

Genus SATURNIA, Schrank.

61. *S. extensa* (Butler), Ill. Typ. Lep. Het. B. M., v., p. 61, pl. 94, fig. 2 (1881).
Two examples; Shillong.

Genus LOEPA, Moore.

62. *L. katinka* (Westw.), Cab. Or. Ent., p. 25, pl. 12, fig. 2 (1848).
Numerous examples.

Genus SALASSA, Moore.

63. *Salassa megastica*, sp. n.

♂ ♀. Of the same brick-red colour as in *S. lola*, but very much larger, the antemedial line of forewings much closer to the base, white outwardly edged with brown, very much outwardly curved and runs close into the base on the hinder margin; the hyaline spot is large, ringed with a black and a white line deeply excavated on the outer side, the excavation filled up by a deep black patch; on the hindwing the difference is greater, the hyaline spot is larger than on the forewings, but of a similar nature, the rings round it are black, white, and again black, then a broad light red space, which on the outer side is very broad and extends well beyond the discal black and white spotted band, which is thin in the disc and curves broadly round the ocellus, the space between it and the red portion being filled in with dark grey; halfway

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between this discal band and the outer margin is a duplex brown band, the inner portion straight, the outer dentate. The female, instead of being brown, as in *S. lola*, merely differs from the male in having the brown bands darker, and the hyaline spots very large on both wings, being nearly half an inch in diameter, and of about equal size. Expanse of wings ♂ ♀, $6\frac{2}{10}$, $6\frac{3}{10}$ inch.

Three males and one female, from Cherra Punji.

Genus CRICULA, Walker.

64. *C. trifenestrata* (Helfer), Journ. As. Soc. Beng., vi., p. 45 (1837).

Common.

Fam. BRAHMÆIDÆ.

Genus BRAHMÆA, Walker.

65. *B. wallichii*, Gray, Zool. Misc., p. 39 (1832).

Many examples; Shillong and Cherra Punji.

66. *B. hearsayi*, White, Proc. Ent. Soc., 1861, p. 26.

Eleven examples; Shillong.

Fam. BOMBYCIDÆ.

Genus OCINARA, Walker.

67. *O. signifera* (Walker), Journ. Linn. Soc., vi., p. 130 (1862).

Shillong and Cherra Punji.

68. *O. cyproba*, sp. n. (Pl. II., fig. 1.)

♂ ♀. Antennæ reddish grey, body and wings pure white, wings thinly clothed, almost semi-hyaline, with many grey bands; first ante-medial, indicated on hindwing by cell spot and a short band at abdominal margin, second discal third sub-marginal, both complete, these bands on the forewings are crossed by longitudinal similar bands, which fill up the second, third, and fifth interspaces, almost from the base to the centre margin, and are crossed by the white veins on both wings. Expanse of wings ♂ $1\frac{2}{10}$, ♀ $1\frac{4}{10}$ inch.

Many males and two females, from Cherra Punji and Shillong.

Far more thinly clothed than *O. signifera*, and without any spots.

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69. *O. apicalis,* Walker, Journ. Linn. Soc., vi., p. 130 (1862).

Shillong and Cherra Punji.

Sub Group III.

Fam. EUPTEROTIDÆ.

Genus GANGARIDES, Moore.

70. *G. roseus* (Walker), xxxii., p. 513 (1865).

Two males and one female, Cherra Punji.

Genus DEBATA, Walker.

71. *D. hades,* Walker, iv., p. 908 (1855).

Shillong and Cherra Punji. Many males and females. The females only differ from the males in their larger size and brighter colour, having sometimes a reddish tinge.

Genus PALIRISA, Moore.

72. *P. lineosa* (Walker), iv., p. 912 (1855).

Shillong and Cherra Punji. One male and several females.

73. *P. cervina* (Moore), P. Z. S., 1865, p. 807.

Shillong, one pair.

Genus TAGORA, Walker.

74. *T. patula,* Walker, v., p. 1189 (1855).

T. undulosa, Walker, v., p. 1196.

Cherra Punji.

75. *T. khasiana* (Moore), Descr. Ind. Lep. Atk., i., p. 77, 1879.

Shillong and Cherra Punji.

76. *T. pallida* (Walker), iv., p. 912, 1855.

Sphingognatha asclepiades, Felder, Reise Nov. Lep., iv., pl. 94, fig. 1 (1868).

Cherra Punji.

I have received numerous specimens of *patula* and *khasiana,* and one male and two females of *pallida.*

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Hampson puts the first two together, but there are undoubtedly three species and not two. There is a small pale fawn-coloured species, ♂ 3⅛, ♀ 4 inches in expanse of wings, similarly coloured in both sexes, identical with Moore's type of *khasiana*, very uniform in size; it has a black head and pale tuft of hairs at basal joint of antennæ. A medium sized form, ♂ 4⅛, ♀ 5 inches, uniform in size, very variable in colour, from pale fawn colour to dark grey and dark reddish fawn colour in the male, always of the latter colour in the female, the females of which fairly well correspond to Walker's types of *patula* and *undulosa*. This species has also in the male a black head and pale tuft of hairs. Finally, there is a large species of which I have received only one male and two females, measuring, ♂ 5, ♀ 6⅛ inches. The male is coloured pale fawn colour like the males of *pallida* from Java and Malayana in my collection. It has an ochreous-red head and tuft of hairs a little darker than in the other species. The females are dark reddish-fawn coloured like the females of *patula*, and also identical in colour with Malayan and Javan females of *pallida*.

Genus Pseudojana, Hampson.

77. *P. incandescens* (Walker), iv., p. 910 (1855).
Cherra Punji; two females.

Genus Ganisa, Walker.

78. *G. postica*, Walker, v., p. 1190 (1855).
Shillong.

79. *G. pandya* (Moore), P. Z. S., 1865, p. 807.
Shillong.

Genus Apha, Walker.

80. *A. subdives*, Walker, v., p. 1180 (1855).
Shillong.

Genus Eupterote, Hübn.

81. *E. lineosa* (Walker), vi., p. 1440 (1855).
Murlida fraterna, Moore, Trans. Ent. Soc., 1884, p. 371.
Shillong.

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82. *E. calandra*, sp. n.

♂ ♀. Antennæ (of the male) with the plumes grey; palpi, head, and fore part of thorax ochreous; shaft of antennæ, body, and wings, above and below, bright citron-yellow, absolutely without any markings; thorax beneath and legs ochreous. Expanse of wings, ♂ $2\frac{7}{10}$, ♀ $3\frac{1}{10}$ inch.

Cherra Punji and Shillong. Numerous examples of both sexes. Antennæ of the male weak, with the pectinations short as in *E. geminata*, Walker, but the wings are broader, with margin of fore wings less oblique. The absence of all markings makes it very distinctive.

83. *E. assimilis*, Moore, Trans. Ent. Soc., 1884, p. 363.

E. dissimilis, Moore, *l.c.*, p. 368.

Cherra Punji.

84. *E. testacea* (Walker), iv., p. 906 (1855).

Shillong; common.

85. *E. axesta*, sp. n. (Pl. II., fig. 2.)

♂. Plumes of antennæ grey; palpi and head red-brown; body and wings above of a uniform sandy-yellow colour; wings crossed by several brown bands; first antemedial outwardly curved, indistinct, obsolete in hind wings; second medial, macular curved in on to the costa of fore wings, followed by three equidistant discal bands, outwardly curved, and composed of small spots. The last on hind wings is linear, a sub-marginal darker band of double lunules, which on hind wings is single and sinuous, cilia brown, underside darker, with the inner band obsolete on both wings; all the other bands present and prominent; legs pink-brown, covered with yellow hair; ♀ pale reddish-brown, with the inner lines more or less obsolete. Expanse of wings, $2\frac{4}{10}$ inch.

Shillong and Cherra Punji; several examples.

Allied to *E. testacea*, but the bands on the latter are linear and mostly straight.

Genus Nisaga, Walker.

86. *N. simplex*, Walker, iv., p. 885 (1855).

Shillong and Cherra Punji.

The female of this species, of which I have received two, has simple antennæ, the body is dark, the wings pale brickdust-colour, slightly tinged with pink.

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Sub Group IV.

Fam. NOTODONTIDÆ.

Genus Tarsolepis, Butler.

87. *T. fulgurifera* (Walker), xiv., p. 1347 (1857).

Cherra Punji; one example.

88. *T. remicauda*, Butler, Ann. Mag. N. H. (4), x., p. 125, pl. 8 (1872).

Shillong; one example.

Genus Dudusa, Walker.

89. *D. nobilis*, Walker, xxxii., p. 447 (1865).

Shillong; one female.

This is the first record of this species within Indian limits; the type came from North China. I have it also from Celebes and Singapore.

Genus Baradesa, Moore.

90. *B. lithosioides*, Moore, P. Z. S., 1883, p. 17, pl. 5, fig. 2.

Shillong and Cherra Punji; numerous specimens.

Genus Phalera, Moore.

91. *P. parivala*, Moore, Cat. Lep. E. I. C., ii., p. 434 (1859).

Shillong and Cherra Punji.

92. *P. raya*, Moore, *l.c.*, p. 434.

Shillong and Cherra Punji.

Genus Gargetta, Walker.

93. *G. costigera*, Walker, xxxii., p. 455 (1865).

Shillong and Cherra Punji; common.

94. *G. curvaria*, Hampson, Faun. Brit. Ind. Moths, i., p. 136 (1892).

Shillong.

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Genus TURNACA, Walker.

95. *T. delineivena*, sp. n.

♀ Palpi dark brown with pale tips to the hairs, antennæ reddish-brown, forewings and thorax grey, forewings with the median and outer veins dark brown and with brown bands on each of these veins, more broadly and better defined in the median vein along its whole length, hinder portion of the wing also suffused with brown, hindwings brown with pale costal margin. Expanse of wings, $2\frac{6}{10}$ inch.

Cherra Punji; two examples.

Genus THACONA, Walker.

Porsica, Walker.

96. *T. ingens* (Walker), XXXV., p. 1823 (1866).

Shillong; two examples.

Genus PYDNA, Walker.

97. *P. testacea*, Walker, vii., 1754 (1856).

Common.

98. *P. kamadena* (Moore), P. Z. S., 1865, p. 812.

Shillong. I have both sexes of this species, it is quite distinct from the preceding, differing in size, markings, and colouration.

99. *P. decurrens* (Moore), Desc. Ind. Lep. Atk., i., p. 66 (1879).

The type came from Cherra Punji, not received by me.

100. *P. notata*, Swinh., Trans. Ent. Soc., 1891, p. 479, pl. 19, fig. 16.

Shillong; one example.

Hampson makes this a synonym of *P. pallida*, Butler, from Japan, but it cannot even belong to the same section of the genus, having simple antennæ in *both* sexes.

101. *P. longivitta* (Walker), vii., p. 1754 (1856).

Shillong; two males, one female.

102. *P. bela*, sp. n.

Antennæ grey; upper side of palpi dark brown; underside

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yellowish-grey; head, thorax, and forewings dark reddish-ochreous; abdomen and hindwings white, tinged with ochreous; forewings irrorated with brown atoms; these, clustered together, form a longitudinal fascia in the centre up to the apex and indications of another fascia below it; some indistinct brown spots in an outwardly curved line from centre of hinder margin towards apex, only apparent in one example; hind wings with the outer border tinged with red. Expanse of wings, $1\frac{4}{10}$ inch.

Cherra Punji; three examples.

Genus Ceira, Walker.

103. *C. aurata* (Moore), Descr. Ind. Lep. Atk., i., p. 64 (1879).

Recorded from the Khasia Hills, by Moore.

104. *C. fasciata* (Moore), *l.c.*, p. 66.

Shillong; two specimens.

Genus Somera, Walker.

105. *S. viridifusca*, Walker, iv., p. 882 (1855).

Shillong and Cherra Punji; many examples.

Genus Cerura, Schrank.

106. *C. liturata*, Walker, v., p. 988 (1855).

Shillong.

Genus Hyperæschra, Butler.

107. *H. pallida*, Butler, Ann. Mag. N. H. (5) vi., p. 65 (1880).

Shillong; numerous examples.

108. *H. basalis* (Moore), P. Z. S., 1865, p. 813.

Cherra Punji.

Genus Antheua, Walker.

109. *A. servula* (Drury), Ins. Exot., ii., p. 20, pl. 11, fig. 11 (1773).

Cherra Punji.

Genus Anticyra, Walker.

110. *A. combusta*, Walker, p. 1092 (1855).

Cherra Punji.

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Genus Fentonia, Butler.

111. *F. argentifera* (Moore), P. Z. S., 1865, p. 813.
Cherra Punji.

Genus Netria, Walker.

112. *N. viridescens* (Walker), vi., p. 1504 (1855).
Cherra Punji.

Genus Spatalia, Hübner.

113. *S. argentifera* (Walker), Journ. Linn. Soc., vi., p. 140 (1862).
Shillong.

114. *S. auritracta* (Moore), P. Z. S., 1865, p. 811.
Shillong.

115. *S. plusioides* (Moore), Descr. Ind. Lep. Atk., i., p. 62 (1879).
Cherra Punji.

Genus Lophopteryx, Stephens.

116. *L. ferruginosa*, Moore, Descr. Ind. Lep. Atk., i., p. 67 (1879).
Cherra Punji.

Genus Besaia, Walker.

117. *B. rubiginea*, Walker, xxxii., p. 459 (1865).
Recorded from the Khasias.

Genus Metaschalis, Hampson.

118. *M. disrupta* (Moore), Descr. Ind. Lep. Atk., i., p. 62 (1879).
Cherra Punji.

Genus Ichthyura, Hübner.

119. *I. fulgurita*, Walker, xxxii., p. 433 (1865).
Shillong.

120. *I. pallida* (Walker), v., p. 1077 (1855).
Shillong, one example.

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Fam. CYMATOPHORIDÆ.

Genus HABROSYNE, Hübner.

121. *H. indica* (Moore), P. Z. S., 1867, p. 44.
Shillong.

122. *H. armata*, Moore, Descr. Ind. Lep. Atk., ii., p. 90 (1882).
Recorded from the Khasia Hills.

Genus THYATIRA, Hübner.

123. *T. batis* (Linn.), Syst. Nat., i., p. 836 (1735).
Shillong and Cherra Punji.

Genus GAURENA, Walker.

124. *G. florescens*, Walker, xxxii., p. 620 (1865).
Recorded from the Khasias.

Genus POLYPLOCA, Hübner.

125. *P. albicosta* (Moore), P. Z. S., 1867, p. 45.
Cherra Punji.

Sub Group V.

Fam. EPICOPIIDÆ.

Genus EPICŒIA, Westw.

126. *E. polydora*, Westw., Arcana Ent., p. 19, pl. 5, fig. 1 (1843).
Shillong and Cherra Punji.

127. *E. varunea*, Moore, P. Z. S., 1865, p. 799.
Shillong and Cherra Punji.

Fam. URANIIDÆ.

Genus NYCTALEMON, Dalman.

128. *N. zampa*, Butler, Ent. Mo. Mag., v., p. 273 (1868).
Shillong and Cherra Punji.

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Fam. MICRONIIDÆ.

Genus URAPTEROIDES, Moore.

129. *U. astheniata* (Guén.), Phal., ii., p. 24 (1857).
Cherra Punji.

Genus STROPHIDIA, Hübner.

130. *S. fasciata* (Cram.), Pap. Exot., ii., p. 12, pl. 104, fig. D (1779).
Shillong.

Genus MICRONIDIA, Moore.

131. *M. simpliciata* (Moore), P. Z. S., 1867, p. 646.
Cherra Punji.

Genus MICRONIA, Guén.

132. *M. aculeata*, Guén., Phal., ii., p. 12, pl. 13, fig. 8, ♀ (1857).
M. gannata, *l.c.*, p. 26, ♂
M. sparsaria, Walker, xxiii., p. 818 (1861).
Shillong and Cherra Punji; common.

Genus PSEUDOMICRONIA, Moore.

133. *P. cœlata*, Moore, Descr. Ind. Lep. Atk., iii., p. 257 (1887).
Shillong; one example.

Genus ACROPTERIS, Hübner.

134. *A. striataria* (Clerck.), Icon., pl. 55, fig. 4 (1759).
Shillong and Cherra Punji.

135. *A. iphiata* (Guén.), Phal., ii., p. 29 (1857).
Micronia pontiata, Guén., *l.c.*
M. convexaria, Walker, xxiii., p. 819 (1861).
Common.

The type of *convexaria* came from Landoor, it was omitted from Cotes and Sunbury's catalogue by oversight.

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136. *A. ciniferaria* (Walker), xxxv., p. 1642 (1866).
Micronia obliquaria, Moore, P. Z. S., 1877, p. 622, pl. 60, fig. 17.
Shillong and Cherra Punji.

The type of *ciniferaria* from Siam is in the O. M., the type of *obliquaria* is from the Andaman Islands; they are not separable.

137. *A. vagata* (Moore), P. Z. S., 1877, p. 622, pl. 60, fig. 18.
Shillong.

Genus Auzea, Walker.

138. *A. rufifrontata*, Walker, xxvi., p. 1487 (1862).
Cherra Punji.

Genus Chatamla, Moore.

139. *C. flavescens* (Walker), ii., p. 406 (1854).
Shillong.

Fam. EPIPLEMIDÆ.

Genus Amana, Walker.

140. *A. angulifera*, Walker, iii., p. 662 (1855).
Shillong and Cherra Punji.

Genus Decetia, Walker.

141. *D. mimicusaria*, Walker, xx., p. 95 (1860).
Shillong and Cherra Punji; several examples.

Genus Paradecetia, Nov.

With the veination of *Decetia*, but with very different antennæ. In *Decetia* the antennæ are pectinated in both sexes. In this genus the antennæ of the male are dentated, the teeth with flat ends and very close together; in the female the rudiments of the dentations only are present.

142. *P. albistellaria* (Walker), xxvi., p. 1522 (1862).
Shillong and Cherra Punji.

I have it also from the Shan States (Manders). The type is in B.M., without locality.

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Genus EPIPLEMA, Herr Schäff.

143. *E. reticulata* (Moore), Descr. Ind. Lep. Atk., iii., p. 259 (1887).

Shillong.

144. *E. himala* (Butler), Ann. Mag. N. H. (5), vi., p. 221 (1880).

Shillong.

145. *E. insolita* (Walker), xxxv., p. 1648 (1866).

Dirades conchiferata, Moore, Lep. Ceylon, iii., p. 403, pl. 186, fig. 11 (1887).

Cherra Punji.

146. *E. fulvilinea*, Hampson, Ill. Typ. Lep. Het. B. M., viii., p. 103, pl. 150, fig. 19 (1891).

Shillong.

I have this also from the Nilgiri Hills, and from Fort Stedman, Shan States.

147. *E. quadricaudata* (Walker), xxiii., 847 (1861).

Erosia varisaria, Walker, xxiii., 848, and xxvi., 1757 (1862).

Cherra Punji.

148. *E. moza* (Butler), Ann. Mag. N. H. (5), i., p. 402 (1878).

Cherra Punji.

The type of this species came from Japan, the Cherra Punji are almost identical with it.

149. *E. ocusta*, sp. n.

♂. Pale chocolate-brown, irrorated with black and brown atoms, both wings crossed by two pale lines, ante and post medial, arising from costa of forewings, from which they are first extended outwards, then abruptly curving inwards run direct to the hinder-margin, are extended across the hindwings, both being deeply elbowed outwardly in their centres, the inner line edged outwardly and the outer line inwardly with black, the black edgings being broad in parts, the outer portion of both wings are suffused with black and brown, two indistinct black spots near hinder angle of forewings and an ochreous patch near outer margin above the middle on the hindwings; on the forewings there is a sub-marginal pale line outwardly edged with black, from the apex, stopping at

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one-third before the hinder angle, at which part of the margin the wing is produced into a small angle; marginal line white, cilia dark brown edged with ochreous grey. Expanse of wings, $\frac{9}{10}$ inch.

Cherra Punji; three examples.

150. *E. sreapa*, sp. n.

♂. Blackish brown, nearly uniform in colour, striations black, two black transverse lines across both wings, ante and post medial most distinct on costa of forewings from which they run outward, and then become sinuous, directly descending to the hinder margin, the outer one having white points; on the hindwings they are not sinuous, the inner one is almost invisible, the outer one is double, an ochreous line between them, it is bent acutely outwards in its centre where it has two small teeth, and some white points in its lower half, a black sub-marginal streak on forewings below the apex, marginal line ochreous, fringe blackish brown. Expanse of wings, $1\frac{2}{10}$ inch.

Cherra Punji; one example.

Genus Dirades, Walker.

151. *D. bicaudata* (Moore), P. Z. S., 1867, p. 643.
Cherra Punji.

Genus Orudiza, Walker.

152. *O. protheclaria*, Walker, xxiii., p. 858 (1861).
Common.

Sub Group VI.

GEOMETERS.

Fam. MENOCTENIIDÆ.

Genus Sarcinodes, Guén.

153. *S. carnearia*, Guén., Phal., i., p. 188 (1857).
Very common.

154. *S. restitutaria* (Walker), xxvi., p. 1527 (1862).
Auxima sumatraria, Walker, xxxv., p. 1577 (1866).
Sarcinodes ægrota, Butler, Ill. Typ. Lep. Het. B. M., vi., p. 60, pl. 115, figs. 3, 4 (1886).
Very common.

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155. *S. æquilinearia* (Walker), xxi., p. 292 (1860).
Shillong; several examples.

156. *S. lilacina*, Moore, Descr. Ind. Lep. Atk., iii., p. 234 (1887).
Cherra Punji and Shillong; common.

157. *S. debitaria* (Walker), xxvi., p. 1527 (1862).
Cherra Punji and Shillong; several examples.

158. *S. susana*, Swinh., Trans. Ent. Soc., 1891, p. 488.
Shillong and Cherra Punji; many examples.

Genus Noreia, Walker.

159. *N. ajaia* (Walker), Journ. Linn. Soc., iii., p. 195 (1859).
Shillong.

Genus Eumelia, Duncan.

160. *E. rosalia* (Cram.), Pap. Exot., iv., p. 152, pl. 368, fig. F. (1782).
Common.

161. *E. flavata*, Moore, Lep. Ceylon, iii., p. 440, pl. 198, fig. 3 ♀ (1887).
Shillong; one example.

162. *E. aureliata*, Guén., Phal. i., p. 394, pl. 22, fig. 6 (1857).
Shillong.

Fam. ORTHOSTYXIDÆ.

Genus Ozola, Walker, xxiv., p. 1080 (1861).
Carima, Walker, xxvi., p. 1630 (1862).
Zarmigethusa, Walker, *l.c.*, p. 1637.

163. *O. microniaria*, Walker, xxiv., p. 1080 (1862).
Cherra Punji.

164. *O. extersaria* (Walker), xxiii., p. 926 (1861).
Shillong and Cherra Punji.

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165. *O. biangulifera* (Moore), Descr. Ind. Lep. Atk., iii., p. 263 (1887).

Shillong and Cherra Punji; common.

The inner band of forewings is acutely bent in on to the costa, but this species can more easily be distinguished from *extersaria* by having the discal band waved up to costa near apex, whereas in *extersaria* it is acutely angled inwards on to the corta at one-third from apex.

Genus Rambara, Moore.

166. *R. efila*, sp. n.

♂. White, both wings with a brown ringlet at the end of the cells, almost lunular in shape, a brown mark in centre of hinder margin of forewings, and a short brown streak before centre of abdominal margin of hindwings, giving with the cell marks the appearance of a broken medial band across both wings; an indistinct discal sinuous brown line on hindwings with slight traces of one on the forewings, a large black sub-apical spot on forewings, and black dots on the outer margin of both wings between the veins. Expanse of wings, $1\frac{4}{10}$ inch.

Cherra Punji; two examples of this fine Rambara.

Genus Naxa, Walker.

167. *N. textilis*, Walker, vii., p. 1743 (1856).

Shillong; two examples.

Orthostixis hügeli, Felder, Reise Nov. Lep., pl. 130, fig. 19 ♂ (1874), is generally made a synonym to the above, but this wrong: there are two distinct species, although the pattern is very much the same; *hügeli* has antennæ very much more deeply pectinated than in *textilis*.

Genus Celerena, Walker.

168. *C. divisa*, Walker, Trans. Ent. Soc. 1862, p. 72.

Shillong and Cherra Punji.

Genus, Iotaphora, Nov.

Palpi short, covered with short stiff hairs, last joint depressed; antennæ of male bipectinate, with short stiff branches to the tips, the pectinations ciliated. Female with simple antennæ; hind-

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wings with vein 2 one fourth from lower end of cell, 3 just before the end, 5 above the centre of disco-cellulars, rather close to the upper end of cell, 6 and 7 from end of cell ; forewings with veins 2 and 3 as in hindwings, 5 from centre of disco-cellulars ; hind tibiæ with two pairs of short spurs.

169. *I. iridicolor* (Butler), Ann. Mag. N. H. (5), vi., p. 227 (1880).

Cherra Punji ; one pair.

Genus Tosaura, Swinh.

170. *T. falcipennis* (Moore), Descr. Ind. Lep. Atk., iii., p. 266, pl. 8, fig. 29 (1887).

Shillong and Cherra Punji ; common.

171. *T. picaria,* Swinh., Trans. Ent. Soc., 1892, p. 16, pl. 1, fig. 16.

Shillong ; many examples.

Fam. GEOMETRIDÆ.

Genus Euschema, Hüb.
Hazis, Boisd.
Heleona, Swainson.

172. *E. militaris* (Linn.), Mus. Lud. Ulr., p. 375 (1764).

Shillong.

173. *E. excubitor,* Moore, P. Z. S., 1878, p. 846.

Shillong.

Genus Pachyodes, Guén.

174. *P. hæmataria* (Herr Schüff.), Exot. Schm., figs. 205, 206 (1850–69).

P. ornataria, Moore, Descr. Ind. Lep. Atk., iii., p. 249 (1887).

Common.

175. *P. rigens* (Butler), Ann. Mag. N. H. (5), vi., p. 127 (1880).

Common.

176. *P. apicalis* (Moore), Descr. Ind. Lep. Atk., iii., p. 247 (1887).

Common.

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177. *P. costistrigaria* (Moore), P. Z. S., 1867, p. 633.
Shillong and Cherra Punji.

178. *P. similis* (Moore), Descr. Ind. Lep. Atk., iii., p. 248 (1887).
P. ruficosta, Hampson, Ill. Typ. Lep. Het. B. M., viii., p. 108, pl. 150, fig. 16 (1891).
Shillong.

179. *P. erionoma*, Swinh., Ann. Mag. N. H. (6), xii., p. 219 (1893).
Shillong; numerous examples.

Genus Absala, Swinh.

180. *A. dorcada*, Swinh., Ann. Mag. N. H. (6), xii., p. 149. (Pl. II., fig. 6.)
Shillong; three males, one female.

Genus Pseudoterpna, Hübn.
Hypochroma, Guén.
Dindica, Moore.
Pingasa, Moore.

181. *P. polyphænaria* (Guén.), Phal., i., p. 280 (1857).
Shillong and Cherra Punji; common.

182. *P. para* (Swinh.), Trans. Ent. Soc. 1891, p. 490.
Shillong; many examples.

183. *P. crenaria* (Guén.), Phal., i., p. 278 (1857).
Hypochroma distenta, Walker, xxi., p. 434 (1860).
H. sublimbata, Butler, Ann. Mag. N. H. (5), x., p. 232 (1882).
Shillong and Cherra Punji.

184. *P. chlora* (Cram.), Pap. Exot., iv., p. 233, pl. 398, fig. c (1782).
Hypochroma lariaria, Walker, xxi., p. 433 (1860).
H. irroratoria, Moore, P. Z. S., 1867, p. 632.
Shillong and Cherra Punji; very common.

185. *P. rufofasciata* (Moore), Descr. Ind. Lep. Atk., iii., p. 247 (1887).
Shillong and Cherra Punji.

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186. *P. ruginaria* (Guén.), Phal., i., p. 278 (1857).
Hypochroma perfectaria, Walker, xxi., p. 434 (1860).
H. nyctemerata, Walker, *l.c.*, p. 444.
Shillong and Cherra Punji; very common.

187. *P. alba* (Swinh.), Trans. Ent. Soc. 1891, p. 491, pl. 19, fig. 6.
Shillong; several males.

Genus Chlorodontopera, Warren.

188. *C. discospilota* (Moore), P. Z. S., 1867, p. 621.
Shillong.

189. *C. chalybeata* (Moore), P. Z. S., 1872, p. 580, pl. 34, fig. 4.
Shillong and Cherra Punji.

Genus Epipristis, Meyrick.
Terpnidia, Warren.

190. *E. minimaria* (Guén.), Phal., i., p. 279 (1857).
Hypochroma parvula, Walker, xxi., p. 435 (1860).
Acidalia truncataria, Walker, xxiii., p. 774 (1861).
Shillong and Cherra Punji.

Genus Herochroma, Swinh.
Actenochroma, Warren.

191. *H. baba*, Swinh., Ann. Mag. N. H. (6), xii., p. 148 (1893).
Shillong; many specimens.

Mr. Warren's paper on Indian Geometers in Coll. Elwes was published in the same month as mine in the Annals, but Part ii. of P. Z. S. was not issued from the printers until three weeks later than the issue of the August number of the Annals and Magazine of Nat. Hist. in which my paper appeared.

192. *H. subtepens* (Walker), xxi., p. 438 (1860).
Shillong; numerous examples.

The type in the O.M. came from Sarawak, it is, however, a common species in the Khasia Hills, and the Khasia Hill examples are identical with the type.

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193. *H. viridaria* (Moore), P. Z. S., 1867, p. 632.
Shillong and Cherra Punji; common.

194. *H. muscicoloraria* (Walker), xxvi., p. 1543 (1862).
Shillong and Cherra Punji.

Genus Maxates, Moore.

195. *M. cœlataria* (Walker), xxii., p. 552 (1861).
Shillong.

196. *M. macariata* (Walker), xxvi., p. 1562 (1862).
Shillong.

Genus Lissolica, Nov.

Differs from *Maxates* in the simple antennæ in both sexes; in the genus *Maxates* the antennæ in the male is bipectinate for two-thirds its length, in the veination also vein 2 of the hindwings arises much nearer the end of the cell.

197. *L. polygrapharia* (Walker), xxi., p. 435 (1860).
Macaria vagata, Walker, xxiii., p. 927 (1861).
Shillong; common.

Genus Episothalma, Swinhoe.

198. *E. sisunaga* (Walker), xxii., p. 550 (1861).
Thalassodes macruraria, Walker, xxvi., p. 1561 (1862).
Shillong; nine specimens.

199. *E. ocellata*, Swinh., Ann. Mag. N. H. (6), xii., p. 218 (1893). (Pl. II., fig. 9.)
Shillong and Cherra Punji; two examples.

Genus Cacamoda, Nov.

♂. Antennæ simple, hindwing produced into a tail; veins 6 and 7 stalked at end of cell, 5 emitted very near 6, forewing with vein 3 emitted before end of cell, 6 and 7 stalked before end of cell.

200. *C. viridata* (Moore), P. Z. S., 1867, p. 623.
Shillong.

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Genus AGATHIA, Guén.

201. *A. lycænaria* (Kollar), Hüg. Kasch., iv., p. 486 (1848).

Common.

202. *A. prasina*, Swinh., Ann. Mag. N. H. (6), xii., p. 219 (1893).

Shillong; three males.

203. *A. lætata* (Fabr.), Ent. Syst., iii., 2, 164 (1793).

Shillong; four specimens.

204. *A. quinaria*, Moore, P. Z. S., 1867, p. 639.

Cherra Punji and Shillong; many examples.

Put with *hilarata*, Guén., in the B.M. collection, but is certainly distinct; *hilarata* only differs from *lætata* in the medial transverse band of forewings: *lætata*, *hilarata*, and *quinaria* are closely allied, but the three forms appear constant without intermediates. I have many examples of each from different parts of India.

205. *A. gemma*, Swinh., Trans. Ent. Soc., 1892, p. 8.

Shillong; five examples.

206. *A. hemithearia*, Guén., Phal. i., p. 381 (1857).

Shillong.

207. *A. beata*, Butler, Ann. Mag. N. H. (5), vi., p. 218 (1880).

Shillong.

208. *A. arcuata*, Moore, P. Z. S., 1867, p. 64.

Shillong and Cherra Punji; very common.

209. *A. codina*, Swinh., Trans. Ent. Soc., 1892, p. 7, pl. 1, fig. 3.

Shillong; four males of this fine species.

Genus TANAORHINUS, Butler.

210. *T. viridiluteata* (Walker), xxii., p. 515 (1861).

Shillong and Cherra Punji; apparently a common species in the Khasias.

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211. *T. reciprocata* (Walker), xxii., p. 515 (1861).
Geometra dimissa, Walker, *l.c.*, p. 516.
Shillong; two examples.

212. *T. kina*, Swinh., Ann. Mag. N. H. (6), xii., p. 150 (1893). (Pl. II., fig. 15.)
Shillong; four males.

Genus Aporandria, Nov.

Antennæ of male deeply pectinated for two-thirds its length, the pectinations ciliated; palpi upturned, thickly covered with hair, last joint short, tip square; hindwings with veins 3 and 4 and 6 and 7 forked one-third their distance beyond the cell, vein 2 emitted less than half the distance from the base to the fork of veins 3 and 4; forewing with vein 3 emitted a short distance before cell, vein 2 from the middle, vein 6 one-fifth beyond cell; hind tibiæ with two short terminal spurs.

213. *A. specularia* (Guén.), Phal., i., p. 342 (1857).
Shillong.

Genus Loxochila, Butler.

214. *L. variegata*, Butler, Ill. Typ. Lep. Het. B. M., vii., p. 104, pl. 136, fig. 3 (1889).
Shillong.

Genus Megalochlora, Meyrick.

215. *M. vittata* (Moore), P. Z. S., 1867, p. 636.
Shillong.

216. *M. avicularia* (Guén.), Phal., i., p. 342 (1857).
Shillong.

Genus Euculoris, Hübn.
Thalassodes, Guén.

217. *E. quadraria* (Guén.), Phal., i., p. 360 (1857).
Thalassodes inconclusaria, Walker, xxii., p. 556 (1861).
Shillong.

218. *E. lunifera* (Moore), Descr. Ind. Lep. Atk., iii., p. 270 (1887).
Type Cherra Punji in Coll. Staudinger: I have not seen this species.

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219. *E. opalina* (Butler), Ann. Mag. N. H. (5), vi., p. 214 (1880).

Shillong and Cherra Punji.

Very closely allied to the preceding, but uniformly larger.

220. *E. liliana* (Swinh.), Trans. Ent. Soc., 1892, p. 7, pl. 1, fig. 2.

Shillong.

221. *E. acte,* Swinh., *l.c.*, p. 6, pl. 1, fig. 13.

Shillong.

222. *E. thalassica* (Moore), Lep. Ceylon, iii., p. 430, pl. 194, fig. 6 (1887).

Cherra Punji.

223. *E. devexata* (♀) (Walker), xxii., p. 573 (1861).

Agathia scintiligera (♂), Butler, Ann. Mag. N. H. (5), vi., p. 216 (1880).

Shillong.

Genus Thalerura, Nov.

Cell of hindwings larger than in *Euchloris*, vein 7 emitted nearer its upper end, antennæ bipectinate for three-fourths from base, the pectinations evenly ciliated.

224. *T. goniaria* (Felder), Reise Nov. Lep., pl. 128, fig. 3 ♀ (1874).

Cherra Punji.

225. *T. urapteraria* (Walker), xxxv., p. 1608 (1866).

Shillong; two examples.

Genus Gelasma, Warren.

226. *G. thetydaria* (Guén.), Phal., i., p. 358 (1857).

Thalassodes bifasciata, Walker, xxvi., p. 1562 (1862).

Shillong.

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227. *G. griseoviridis*, Warren, P. Z. S., 1893, p. 353, pl. 31, fig. 6.
Cherra Punji.

Genus ŒNOSPILA, Swinhoe.

228. *Œ. lyra*, Swinh., Trans. Ent. Soc., 1892, p. 5.
Shillong and Cherra Punji; many specimens.

229. *Œ. strix* (Butler), Ill. Typ. Lep. Het. B. M., vii., p. 105, pl. 136, fig. 8 (1889).
Cherra Punji.

Genus NEMORIA, Hübn.
Hemithea, Dup.

230. *N. insularia* (Guén.), Phal., i., p. 315 (1857).
Thalera insularia, Hampson, Ill. Typ. Lep. Het. B. M., viii., 28, 777 (1891).
Shillong and Cherra Punji.

The Cherra Punji examples are much larger than those from Shillong, but there is no specific difference between them.

Genus THALERA, Hübn.

231. *T. disjuncta*, Walker, xxii., p. 595 (1861).
Shillong.

232. *T. graminea*, Hampson, Ill. Typ. Lep. Het. B. M., viii., p. 109, pl. 151, fig. 1 (1891).
Cherra Punji.

Genus EUCROSTES, Hübn.
Comibæna, Hübn.
Uliocnemis, Warren.

233. *E. sanguilineata* (Moore), P. Z. S., 1867, p. 638.
Cherra Punji.

234. *E. partita* (♂) (Walker), xxii., p. 573 (1861).
Comibæna felicitata, (♀), Walker, *l.c.*, p. 579.
Thalera concisiplaga (♂), Walker, *l.c.*, p. 598.
Cherra Punji.

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235. *E. integranota* (Hampson), Ill. Typ. Lep. Het. B. M., ix., p. 146, pl. 170, fig. 13.

Cherra Punji.

236. *E. kafebera*, sp. n.

♂ White, forewings with a green transverse sub-basal band, a broader discal band, and between these a large green spot separated from the bands by a fine white line; this discal band is continued on the hindwings as a medial band, bent outwards in the middle; both wings with a submarginal macular green band, the spots formed by the white veins and a white outer festoon; these bands have between them white bands, through the centre of which runs a fine sinuous green line, outer margin and cilia green, the veins white and white streaks in the cilia opposite the veins; thorax green, abdomen with green segmental band; underside white. Expanse of wings, $1\frac{2}{10}$ inch.

Cherra Punji; two examples.

I feel uncertain as to the genus of this insect, and as Mr. Hampson is now working out the genera of the Geometridæ, I prefer leaving it to him to determine.

Genus Berta, Walker.

237. *B. chrysolineata*, Walker, xxvi., p. 1621 (1862).

Shillong.

Genus Timandra, Dup.

238. *T. aventiara* (Guen.), Phal. ii., p. 3 (1857).

Shillong.

239. *T. convectaria* (Walker), xxiii., p. 800 (1861).

Timandra comptaria, Walker, xxvi., p. 1615 (1862).

Shillong and Cherra Punji.

240. *T. responsaria* (Moore), Descr. Ind. Lep. Atk., iii., p. 255 (1887).

Shillong and Cherra Punji.

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Fam. ACIDALIDÆ.

Genus Perixera, Meyrick.

241. *P. obrinaria* (Guén.), Phal., i., p. 414 (1857).
Shillong.

242. *P. absconditaria* (Walker), xxvi., p. 1580 (1861).
Common.

Genus Mesotrophe, Hampson.

243. *M. expunctaria* (Walker), Journ. Linn. Soc., iii., p. 195 (1859).
A. ovisignata, Moore, Lep. Ceylon, iii., p. 444 (1887).
Shillong.

Genus Trirachopoda, Hampson.

244. *T. obstataria* (Walker), xxiii., p. 769 (1861).
Anisodes subroseata, Walker, xxvi., p. 1582 (1862).
A. acuta, Moore, Lep. Ceylon, iii., p. 445, pl. 215, fig. 9 (1887).
Shillong.

Genus Anisodes, Guén.

245. *A. lichenaria*, Swinh., Trans. Ent. Soc., 1892, p. 8.
Shillong.

246. *A. intermixtaria*, Swinh., *l.c.*
Shillong.

247. *A. pulverentula*, Swinh., *l.c.*, p. 9, pl. 1, fig. 8.
Shillong.

248. *A. heydena*, sp. n.

♂. Yellowish straw colour, upperside of palpi black; wings irrorated with brown atoms, forewings with a very large chocolate-brown oval patch in the centre, a suffused, sinuous short band running upwards from it, hindwings with a similar central smaller spot, pale in its centre, a sub-basal transverse brown line, an ante-medial thin brown band touching the inner side of the spot, and a

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discal brown line running evenly with the outer margin across both wings; on forewings there are two small suffused brown patches on the margin, one at the apex and the other below it; marginal points black, one on each vein and one between each vein. Expanse of wings, $1\frac{4}{10}$ inch.

Cherra Punji; one example.

249. *A. dotilla*, sp. n.

♂ Dark pinkish-grey, wings densely irrorated with minute brown atoms, a white dot at the end of each cell, those on the hindwings ringed with black, both wings with a discal row of black dots on the veins and a similar row of marginal dots, cilia pale grey. Underside body and wings suffused with pink, a discal sinuous pale brown indistinct line with pale black points across both wings, marginal line brown, legs pink, abdomen grey. Expanse of wings, $1\frac{3}{10}$ inch.

Cherra Punji; one example.

Genus Dithalma, Meyrick.

250. *D. idæa* (Swinhoe), Trans. Ent. Soc. 1892, p. 6.
Shillong and Cherra Punji.

251. *D. crina* (Swinhoe), *l.c.*, p. 14, pl. 1, fig. 14.
Shillong.

252. *D. albivertex* (Swinhoe), *l.c.*, p. 15.
Shillong and Cherra Punji.

253. *D. hampsoni* (Swinhoe), *l.c.*, p. 14.
Shillong.

254. *D. mecysma*, sp. n.

♂ ♀. Dark mouse colour, wings very minutely irrorated with grey, an indistinct black dot at the end of each cell, both wings crossed by ante-medial and post-medial nearly straight brown lines, the latter a little outwardly bent below the middle on the hindwings, forewings with a discal similar line, and both wings with brown marginal lines, cilia grey, underside grey, lines as above. Expanse of wings, $\frac{9}{10}$ inch.

Cherra Punji; numerous specimens.

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Genus Erithrolophus, Swinh.
Organopoda, Hampson.

255. *E. fascicorpus*, Swinh., Trans. Ent. Soc. 1892, p. 11.
Shillong.

256. *E. carnearia* (Walker), xxii., p. 644 (1861).
Shillong. The cell spot in both wings is very variable in size, and sometimes in the forewings it is obsolete.

Genus Synegiodes, Swinh.

257. *S. diffusifascia*, Swinh., Trans. Ent. Soc. 1891, p. 11, pl. 1, fig. 9, and Ann. Mag. N. H. (6), xii., p. 150 (1893).
Common.

258. *S. histrionaria*, Swinh., Trans. Ent. Soc. 1891, p. 12.
Common.

Genus Streptopteron, Swinh.

259. *S. posticamplum*, Swinh., *l.c.*, p. 10, pl. 1, fig. 12.
Shillong. The type specimen is the only example received of this extraordinary insect.

Genus Chrysocraspeda, Warren.

260. *C. abhadraca* (Walker), xxii., p. 630 (1861).
Cherra Punji.

Genus Acidalia, Treit.

261. *A. walkeri*, Butler, P. Z. S., 1883, p. 170.
A. extimaria, Walker, xxiii., p. 794, No. 280, nec. 782, No. 252 (1861).
Shillong and Cherra Punji.

262. *A. opsinaria*, Swinh., Trans. Ent. Soc. 1892, p. 15.
Shillong.

263. *A. similaria* (Moore), P. Z. S., 1867, p. 841.
Shillong.

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264. *A. attentata*, Walker, xxii., p. 754 (1861).
Shillong.

265. *A. patularia*, Walker, xxxv., p. 1633 (1866).
Shillong.

266. *A. remotata*, Guén., Phal., i., p. 458 (1857).
Shillong.

267. *A. nesciaria*, Walker, xxii., p. 750 (1861).
A. negataria, Walker, xxii., p. 751.
Cherra Punji.

268. *A. fibulata*, Guen., Phal., i., p. 490, pl. 15, fig. 5 (1857).
Cherra Punji.

Genus CRASPEDIA, Hübn.

269. *C. pallivittata* (Moore), P. Z. S., 1867, p. 641.
Shillong and Cherra Punji.

270. *C. arenosaria* (Moore), Lep. Ceylon, iii., p. 445 (1887).
Shillong.

271. *C. addictaria* (Walker), xxii., p. 749 (1861).
Cherra Punji.

Genus RHODOSTROPHIA, Hübner.
Phyletis, Guén.
Delocharis, Butler.

272. *R. stigmatica*, Butler, Ill. Typ. Lep. Het. B. M., vii., p. 110, pl. 136, figs. 19, 20 (1889).
Shillong.

273. *R. prasonaria* (Swinh.), Trans. Ent. Soc., 1892, p. 12.
Tanaotrichia trilineata, Warren, P. Z. S., 1893, p. 361, pl. 32, fig. 2.
Shillong.

274. *R. pelloniaria* (Guén.), Phal., ii., p. 169 (1857).
Shillong and Cherra Punji; common.

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275 *R. khasiana* (Moore), Desc. Ind. Lep. Atk., iii., p. 264 (1887).

Cherra Punji; a very distinct species.

276. *R. similata*, Moore, Desc. Ind. Lep. Atk., iii., p. 264 (1887).

The type came from the Khasia Hills, not in my collection.

This genus links the *Acidulidæ* with the *Geometridæ*, vein 5 in both wings being emitted above the centre of discocellulars.

Genus Hyria, Steph.

277. *H. ferruginaria* (Moore), P. Z. S., 1867, p. 654.

278. *H. marginata*, sp. n.

♂. Rosy grey, minutely irrorated with rosy red atoms, forewings with a black mark at the end of the cell, both wings crossed by indistinct sinuous red lines, ante-medial, medial, and post-medial, the first obsolete on hindwing, the last with brown points on the veins, costa of forewings and marginal line on both wings dark reddish brown, thick, and very prominent, cilia rosy. Expanse of wings, $\frac{7}{10}$ inch.

Cherra Punji.

Genus Defoa, Swinh.
Lipomelia, Warren.

279. *D. ustata*, Swinh., Ann. Mag. N. H. (6), xii., p. 151 (1893).

Lipomelia subusta, Warren, P. Z. S., 1893, p. 360, pl. 32, fig. 24.

Shillong and Cherra Punji.

Genus Somatina, Guén.

280. *S. rosacea*, sp. n.

♂. Front white, collar and abdomen rosy, thorax white, abdomen with darker segmental bands; forewings greyish white with the interior portions suffused with rosy, a black point at end of

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cell, a patch of darker rosy grey in the disc, limited outwardly by a pale whitish sinuated line which commences on the hinder margin near the angle, and curves inwards round the top of the cell. On the inner side of this line there is a brownish suffusion, a submarginal grey band arising from a small black patch near the hinder angle, and curving inwards in to the centre where it is double, leaving the apex white, marginal line black, slightly lunular; hindwings rosy, a more distinct black point at the end of cell, a submarginal pale sinuous line, inwardly broadly edged with brownish; a marginal white band with the ground colour running into it in parts, and a black marginal line as in forewings, cilia of both wings white, interlined with rosy grey. Expanse of wings, $1\frac{3}{10}$ inch.

Cherra Punji; two examples.

Genus Runeca, Moore.

281. *R. ferrilineata*, Moore, Desc. Ind. Lep. Atk., iii., p. 252, pl. 8, fig. 13 (1887).

Cherra Punji.

Genus Problepsis, Led.
Argyris, Guén.

282. *P. apollinaria* (Guén.), Phal., ii., p. 13 (1857).

Shillong and Cherra Punji.

With the discal ocelli of forewings very large and quite round.

283. *P. deliaria*, Walker, xxiii., p. 808 (1861).

Shillong.

Very doubtfully distinct from *apollinaria*.

284. *P. delphiaria*, Guén., Phal., ii., p. 14 (1857).

P. vulgaris, Butler, Ill. Typ. Lep. Het. B. M., vii., p. 43, pl. 125, fig. 2 (1889).

Shillong.

285. *P. extrusaria*, Walker, xxii., p. 637 (1861).

Cherra Punji.

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Genus Alex, Walker.
Orgalmia, Walker.
Gamoruna, Moore.

286. *A. palparia* (Walker), xxiii., p. 988 (1861).
A. nigrozonata, Walker, xxvi., p. 1754 (1862).
Gamoruna palparia, Moore, Descr. Ind. Lep. Atk., iii., p. 265 (1887).
Shillong and Cherra Punji; common.

Genus Geoglada, Nov.

Closely resembles *Alex* in appearance, but in the male the antennæ is serrate; in *Alex* it is bi-pectinate. The cell is longer, vein 5 of hindwings is free; in *Alex* it is stalked with 6.

287. *G. helicola*, n. sp.

♂. Olive-brown, without the red colour always to be found in *A. palparia*, the transverse band and other markings very similar. Sometimes there is a large blackish-brown spot on forewings near the hinder angle, but this is often absent; the underside, however, is very distinctive; the bands are more like lines, and well defined; the medial band is farther away from the base in the hindwings than in *Alex*, and is well curved; the sub-marginal band in a semi-dentated line, not a diffuse band; and on the forewings there is an inwardly curved thin band inside the middle band, and rising from its lower end, runs up towards the costa. Expanse of wings, 2 inches.

Shillong and Cherra Punji. Many examples, but not nearly so common as *Alex*, the type female of which in the B. M. has been carefully examined.

Genus Trygodes, Guén.

288. *T. divisaria*, Walker, xxiii., p. 927 (1861).
Shillong and Cherra Punji.

Fam. LARENTIIDÆ.

Genus Gonanticlea, Swinh.

289. *G. aversa*, Swinh., Trans. Ent. Soc., 1892, p. 4.
Shillong; common.

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290. *G. occlusata* (Felder), Reise Nov. Lep., pl. 132, fig. 16 (1874).
Shillong and Cherra Punji.

Genus Collix, Guén.

291. *C. hypospitata*, Guén., Phal., ii., p. 358 (1857).
Shillong.

292. *C. ghosha*, Walker, xxiv., p. 249 (1862).
Shillong.

Genus Remodes, Guén.

293. *R. abnormis*, Moore, Descr. Ind. Lep. Atk., iii., p. 271, pl. 8611 (1887).
Cherra Punji.

294. *R. decussata* (Moore), P. Z. S., 1867, p. 655, pl. 33, fig. 10.
Cherra Punji.

295. *R. fasciata*, Moore, *l.c.*, p. 270.
The type came from Cherra Punji.

296. *R. interruptaria*, Moore, *l.c.*
Recorded from the Khasia Hills.

297. *R. lineosa*, Moore, Descr. Ind. Lep. Atk., iii., p. 270, pl. 8610 (1887).
Shillong.

Genus Cabige, Walker.

298. *C. rachiaria*, Swinh., Trans. Ent. Soc. 1891, p. 492.
Shillong and Cherra Punji.

299. *C. lunulineata*, Moore, Descr. Ind. Lep. Atk., iii., p. 263, pl. 8, fig. 26 (1887).
Cherra Punji.

300. *C. zalska*, sp. n.

♂. Ochreous grey, striated with brown; forewings with the costa marked with black and pale spots, crossed by an inner indistinct and incomplete brownish band, a discal, sinuous brownish line, double in parts, and with two or three square black spots in patches on its outer side above the hinder angle, where there are also some black and white striations marking the wing, and

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extending in a band-like form up the outer margin: hindwings with the outer portion darkly and thickly striated with brown, more broadly pale, with black striations and band on the outer portions of both wings. Expanse of wings, $\frac{7}{8}$ inch.

Cherra Punji.

A very obscure-looking little insect, allied to nothing I know of, received in great numbers.

Genus Phibalapteryx, Steph.

301. *P. plurilineata*, Moore, Descr. Ind. Lep. Atk., iii., p. 273 (1887).

P. nigrovittata, Warren, P. Z. S., 1888, p. 327.
P. nigripunctata, Warren, *l.c.*, p. 328.

Shillong. Identical with my *Thundiani* examples.

Genus Ziridava, Walker.

302. *Z. cylindraria*, Walker, xxvi., p. 1550 (1862).

Menophra (?) *rubridisca*, Hampson, Ill. Typ. Lep. Het. B. M., viii., p. 106, pl. 150, fig. 8 (189).

Shillong; common.

Genus Ardonis, Moore.

303. *A. chlorophilata* (Walker), xxvi., p. 1768 (1862).

Shillong.

Genus Eupithecia, Curt.

304. *E. felicata*, Swinh., Trans. Ent. Soc. 1892, p. 1.

Shillong and Cherra Punji; many examples.

305. *E. infestata*, Swinh., P. Z. S., 1889, p. 430.

Cherra Punji.

306. *E. dentifascia*, Hampson, Ill. Typ. Lep. Het. B. M., viii., p. 172, pl. 152, fig. 12 (1891).

Shillong.

307. *E. rigida*, Swinh., Trans. Ent. Soc. 1892, p. 2.

Shillong.

308. *E. infestata*, Swinh., P. Z. S., 1889, p. 430.

Cherra Punji.

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309. *E. atroviridis*, Warren, P. Z. S., 1893, p. 384, pl. 31, fig. 19.
Shillong.

310. *E. griseipennis*, Moore, Descr. Ind. Lep. Atk., iii., p. 269, pl. 1, fig. 28 (1887).
Cherra Punji.

311. *E. incurvata*, Moore, *l.c.*, p. 268.
The type came from the Khasias.

312. *E. rufifascia*, Hampson, Ill. Typ. Lep. Het. B. M., ix., p. 152, pl. 171, fig. 15 (1893).
Cherra Punji.

Genus Lygranoa, Butler.

313. *L. rectilineata*, Moore, Descr. Ind. Lep. Atk., iii., p. 272 (1887).
The type came from the Khasia Hills.

Genus Bardanes, Moore.

314. *B. plicata*, Moore, Descr. Ind. Lep. Atk., iii., p. 251, pl. 8, fig. 22 (1887).
Shillong.

Genus Lobophora, Steph.

315. *L. decorata*, Moore, *l.c.*, p. 272.
Shillong and Cherra Punji.

316. *L. pulcherrima*, Swinh., Ann. Mag. N. H. (6), xii., p. 224 (1893).
Shillong.

Genus Dysethia, Warren.

317. *D. ocyptaria* (Swinh.), Ann. Mag. N. H. (6), xii., p. 157 (1893).
Shillong.

Genus Cambogia, Guén.

318. *C. pulchella* (Hampson), Ill. Typ. Lep. Het. B. M., viii., p. 124, pl. 153, fig. 22 (1891).
Cherra Punji.

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Genus Laciniodes, Nov.

Antennæ simple in both sexes ; palpi depressed, short, covered with hairs ; hindwing with the lower portion of cell much extended, vein 3 emitted from the end, 2 at one third before end, 5 a little above middle of disco-cellular, 6 and 7 forked at nearly half the distance beyond upper end of cell ; forewing with vein 3 emitted a little before end of cell, 2 at one third before end, 5 a little above centre of disco-cellular, 6 and 7 at upper end of cell ; mid-tibia with one pair of terminal spurs ; hind-tibia with two pairs.

319. *L. plurilinearia* (Moore), P. Z. S., 1867, p. 645.
Shillong and Cherra Punji.

There are two forms of this insect, one being without any of the usual dark markings on the wings.

Genus Plemyria, Hüb.

320. *P. catenaria* (Moore), P. Z. S., 1867, p. 655, pl. 33, fig. 9.
Shillong.

Genus Polynesia, Swinh.

321. *P. truncapex*, Swinh., Trans. Ent. Soc. 1892, p. 5.
Shillong.

Genus Cryptoloba, Warren.

322. *C. aerata* (Moore), P. Z. S., 1867, p. 654.
Shillong.

Genus Xanthorhoë, Hüb.
Coremia, Guén.

323. *X. conturbata* (Walker), xxvi., p. 1703 (1862).
Shillong.

Genus Epirrhoë, Hüb.

324. *E. exliturata* (Walker), xxiv., p. 1195 (1862).
Shillong.

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Genus CIDARIA, Treit.

325. *C. relata,* Butler, Ann. Mag. N. H. (5), vi., p. 229 (1880).

Shillong.

326. *C. aliena,* Butler, *l.c.*, p. 230.

Shillong.

327. *C. fecunda,* Swinh., Trans. Ent. Soc. 1891, p. 493.

Shillong and Cherra Punji.

328. *C. scortea,* Swinh., *l.c.*

Shillong.

329. *C. delecta,* Butler, Ann. Mag. N. H. (5), vi., p. 229 (1880).

Shillong; common.

330. *C. curcumata,* Moore, Descr. Ind. Lep. Atk., iii., p. 278 (1887).

Shillong and Cherra Punji.

331. *C. decurrens,* Moore, Descr. Ind. Lep. Atk., iii., p. 276 (1887).

Cherra Punji.

332. *C. bareconia,* sp. n.

♂ ♀. Palpi, antennæ, head and body black; forewings with the basal half dark blackish-brown, with its outer edge somewhat sinuous and bent slightly outwards above the middle, crossed in its centre by a pale thin band which has a thin black line in it, is sometimes indistinct and sometimes obsolete, a transverse brown line close to the outer edge of the basal half followed by a pale pinkish-grey band, and then a number of transverse lines close together right up to the outer margin, where there is a black patch near the hinder angle, another below the apex, and a third in the costa near the apex; sometimes the outer lines are obsolete, and the outer portions of the wings grey with the black patches showing more prominently; hindwings dark brownish-grey, with indistinct transverse grey bands, which however, are often obsolete; underside dark grey, crossed by indistinct central and discal darker bands. Expanse of wings, $\frac{8}{10}$—$\frac{9}{10}$ inch.

Cherra Punji; many examples.

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333. *C. substituta*, Walker, xxxv., p. 1691 (1866).
Shillong.

334. *C. chalybearia*, Moore, P. Z. S., 1867, p. 663.
Shillong.

335. *C. cervinaria*, Moore, *l.c.*, p. 664.
Shillong.

336. *C. nivicincta*, Butler, Ill. Typ. Lep. Het. B. M., vii., p. 119, pl. 137, fig. 20 (1889).
Shillong.

337. *C. viridata*, Moore, P. Z. S., 1867, p. 661.
Shillong.

338. *C. aurata*, Moore, *l.c.*, p. 664.
Shillong.

Genus Paralophia, Warren.

339. *P. pustulata*, Warren, P. Z. S., 1893, p. 371, pl. 30, fig. 7.
Cherra Punji.

Genus Eustroma, Hübn.

340. *E. dissecta*, Moore, Lep. Ceylon, iii., p. 488, pl. 207, fig. 9 ♀ (1887).
Shillong and Cherra Punji.

341. *E. triangulifera*, Moore, Descr. Ind. Lep. Atk., iii., p. 275 (1887).
Shillong; common.

342. *E. obscurata*, Moore, P. Z. S., 1867, p. 633, pl. 33, fig. 7.
Shillong; very common.

343. *E. furva* (Swinh.), Trans. Ent. Soc. 1891, p. 494.
Shillong and Cherra Punji.

344. *E. dentifera*, Moore, Descr. Ind. Lep. Atk., iii., p. 275 (1887).
The type came from Cherra Punji.

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345. *E. monana*, Swinh., Ann. Mag. N. H. (6), xii., p. 224 (1893). (Pl. II, fig. 10.)
Shillong.

346. *E. multifaria* (Swinh.), P. Z. S., 1889, p. 429, pl. 44, fig. 9.
Cherra Punji.

347. *E. aurigena* (Butler), Ann. Mag. N. H. (5), vi., p. 230 (1880).
Cherra Punji.

Genus Scotosia, Steph.

348. *S. sordidata*, Moore, Descr. Ind. Lep. Atk., iii., p. 274 (1887).
Shillong and Cherra Punji.

Genus Gandaritis, Moore.

349. *G. flavata*, Moore, P. Z. S., 1867, p. 660.
Cherra Punji.

Genus Photoscotosia, Warren.

350. *P. miniosata*, Walker, xxv., p. 1354 (1862).
Shillong.

Genus Anthyria, Swinh.

351. *A. grataria* (Walker), xxii., p. 663 (1861).
Shillong.

352. *A. iole*, Swinh., Trans. Ent. Soc. 1892, p. 2.
Shillong.

353. *A. lunulosa* (Moore), Lep. Ceylon, iii., p. 450, pl. 200, figs. 5, 5a (1887).
Shillong and Cherra Punji.

Genus Pomasia, Guén.

354. *P. moniliata*, Warren, P. Z. S., 1893, p. 367, pl. 32, fig. 9.
Type, Khasia Hills, in coll. Elwes.

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Genus Asthena, Hübn.

355. *A. ochracea*, Warren, P. Z. S., 1888, p. 231.

A. ochracea, Elwes, P. Z. S., 1893, p. 264, pl. 32, fig. 10 ♀.

Recorded from Shillong.

Genus Psilocambogia, Hampson.

356. *P. rapistriaria* (Swinh.), Trans. Ent. Soc. 1890, p. 210, pl. 7, fig. 9.

Shillong.

357. *P. deviaria* (Walker), xxii., p. 664 (1861).

Shillong.

Genus Rhodometra, Meyrick.

358. *R. sacraria* (Linn.), Nat. i., 2, 863, 220 (1766).

Cherra Punji.

Fam. BOARMIIDÆ.

Section I. URAPTERYGINÆ.

Genus Urapteryx, Leach.

359. *U. multistrigaria*, Walker, xxxv., p. 1535 (1866).

Shillong and Cherra Punji.

360. *U. sciticaudaria*, Walker, xxvi., p. 1480 (1862).

Shillong.

361. *U. picticaudata*, Walker, xx., p. 12 (1860).

Shillong and Cherra Punji.

This species, the type of which is in O.M. from Borneo, is quite distinct from the yellow form; *sciticaudaria* is uniformly much larger, and with different markings.

362. *U. primularis*, Butler, Ill. Typ. Lep. Het. B. M., vi., p. 49, pl. 113, fig. 4 (1886).

Shillong.

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Genus THINOPTERYX, Butler.

363. *T. crocopterata* (Kollar), Kasch von Hügel, iv., p. 483 (1848).

Shillong and Cherra Punji; very common.

364. *T. prætoraria* (Felder), Reise Nov. Lep., pl. 122, fig. 13, ♂ (1893).

Shillong.

365. *T. nebulosa*, Butler, Journ. Linn. Soc., 1883, p. 203.

Shillong and Cherra Punji. Quite distinct from the preceding. I have a fine series of both of them without any intermediates.

Genus XEROPTERYX, Butler.

366. *X. columbicola* (Walker), xx., p. 11 (1860).

Shillong.

Genus SIRINOPTERYX, Butler.

367. *S. rufivinctata* (Walker), xxvi., p. 1747 (1862).

Shillong and Cherra Punji; very common.

Section II. DEILINIINÆ.

Genus BAPTA, Steph.

368. *B. margarita* (Moore), P. Z. S., 1867, p. 617.

Corycia alba, Moore, Descr. Ind. Lep. Atk., iii., p. 261 (1887).

Shillong.

369. *B. platyleucata* (Walker), xxxv., p. 1628 (1866).

Cherra Punji.

370. *B. indistincta* (Moore), Descr. Ind. Lep. Atk., iii., p. 261 (1887).

Shillong and Cherra Punji.

371. *B. inamata* (Walker), xxii., p. 755 (1861).

Shillong and Cherra Punji.

Genus DEILINIA, Hübn.

372. *D. luteifrons*, sp. n. (Pl. II., fig. 14.)

♀. Pure white; front luteous; wings crossed by three indistinct dentated grey lines; ante-medial, medial, and discal at even

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distances apart; fore legs with ochreous tibiæ; hind legs with brown bands on the tarsi. Expanse of wings, 1½ inch.

Cherra Punji. Two examples.

Genus Petelia, Herr Schäff.

373. *P. medardaria*, Herr Schäff, Exot. Schm., pl. 94, fig. 534 (1856).

Shillong and Cherra Punji.

374. *P. fasciata* (Moore), P. Z. S., 1867, p. 634, pl. 32, fig. 8.

Shillong.

375. *P. riobearia* (Walker), xx., p. 129 (1860).

Shillong and Cherra Punji; common.

376. *P. capitata* (Walker), xxiii., p. 1019 (1861).

Alana rubiginata, Walker, xxxv., p. 1568 (1866).

Cherra Punji.

377. *P. albopunctata* (Swinh.), Trans. Ent. Soc., 1891, p. 491.

Shillong.

378. *P. cervinaria* (Moore), Descr. Ind. Lep. Atk., iii., p. 233 (1887).

Cherra Punji.

Genus Tasta, Walker.
Dissophthalmus, Butler.

379. *T. micaceata*, Walker, xxvi., p. 1570 (1862).

Dissophthalmus iridis, Butler, Ann. Mag. N. H. (5), vi., p. 219 (1880).

Cherra Punji.

Genus Myreteta, Walker.
Orthocabera, Butler.
Microniodes, Hampson.

380. *M. planaria*, Walker, xxiii., p. 831 (1861).

Shillong.

381. *M. ocernaria* (Swinh.), Ann. Mag. N. H. (6), xii., p. 152 (1893). (Pl. II., fig. 8.)

Shillong.

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382. *M. brunneiceps* (Warren), P. Z. S., 1893, p. 387, pl. 31, fig. 23.
Shillong and Cherra Punji.

Genus CABERODES, Guén.

383. *C. achromaria*, Guén., Phal. i., p. 136 (1857).
Shillong and Cherra Punji.

384. *C. costalis* (Moore), P. Z. S., 1867, p. 616.
Shillong.

Genus HETEROSTEGANE, Hampson.

385. *H. subtessellata* (Walker), xxvi., p. 1648 (1862).
Shillong, Cherra Punji.

386. *H. lala* (Swinh.), Trans. Ent. Soc., 1892, p. 13.
Shillong.

Genus STEGANIA, Guén.

387. *S. latifasciata* (Moore), Descr. Ind. Lep. Atk., iii., p. 200 (1887).
Cherra Punji.

388. *S. peralba*, sp. n. (Pl. II., fig. 5.)

♂ ♀. Of a uniform white colour, tinged with grey. Above there are very few markings. Costal line of forewings flesh colour, marked with black; and on the hind wings the cell spot and black band of the underside is slightly visible; on the underside there is a minute black dot at the end of cell on forewings; and on the hindwings the black spot and black discal band are very prominent; legs flesh-colour. Expanse of wings, ♂ $\frac{9}{10}$, ♀ $1\frac{1}{10}$ inch.
Cherra Punji; two males, one female.

Genus MICRONISSA, Swinh.

389. *M. dephinaria*, Swinh., Ann. Mag. N. H. (6), xii., p. 152 (1893).
Shillong.

Genus PLUTODES, Guén.

390. *P. flavescens*, Butler, Ann. Mag. N. H. (5), vi., p. 223 (1880).
Shillong; common.

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391. *P. exquisata*, Butler, Ann. Mag. N. H. (5), vi., p. 223 (1880).

Shillong; a fine series.

392. *P. subcaudata*, Butler, *l.c.*, p. 224.

Shillong; many examples.

393. *P. prasina*, Swinh., Trans. Ent. Soc., 1892, p. 13, pl. 1, fig. 10.

Shillong and Cherra Punji.

394. *P. costatus*, Butler, Ill. Typ. Lep. Het. B. M., vi., p. 53, pl. 114, fig. 4 (1886).

P. triangularis, Warren, P. Z. S., 1893, p. 388.

Shillong and Cherra Punji; very common.

This is a variable species, and Mr. Warren could not have had a sufficient number before him when describing *triangularis*; none of the points of difference mentioned by him hold good. I have examples from Solon, near Simla, and a long series from Shillong and Cherra Punji. The costal band of forewings varies in width, the triangular central tooth varies in size; in one example it is continued in the form of a yellow bar right across the wing to the hinder angle, and similarly the antemedial transverse line in some examples runs into the yellow band just before the first tooth, but in others it runs into the tooth.

395. *P. lamisca*, sp. n.

♂. Bright ochreous yellow, thorax (except the collar) and abdomen chocolate-brown; wings patched and marked with the same colour; forewings with a patch at base extending also down the abdominal margin of hindwings, as in all the species of the *Cyclaria* group; a large discal patch on forewings with dentated margin all round, and joined to the basal patch by an irregular band; on hindwings two bands of small spots, discal and submarginal, with a diffuse patch between them below the middle. Expanse of wings, $1\frac{3}{16}$ inch.

Cherra Punji; three examples.

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Section III. ENNOMINÆ.

Genus DALIMA, Moore.
Panisala, Moore.
Metoxidia, Butler.
Hololoma, Warren.

396. *D. intricata*, Warren, P. Z. S., 1893, p. 396.

Shillong.

397. *D. patnaria*, Felder, Reise Nov. Lep., pl. 122, fig 12, ♂ (1873).

Shillong; common.

398. *D. truncataria* (Moore), P. Z. S., 1867, p. 620.

Cherra Punji.

399. *D. patularia* (Walker), xx., p. 247 (1860).

Shillong and Cherra Punji. A very variable species, I have them in all colours, from dark purplish brown to pale yellowish grey.

400. *D. calaminia* (Butler), Ann. Mag. N. H. (5), vi., p. 121 (1880).

Shillong; many examples.

Genus HYPOCHROSIS, Guén.
Omiza, Walker.
Marcala, Walker.
Celenna, Walker.
Phœnix, Butler.

401. *H. pachiaria* (Walker), xx., p. 247 (1860).

Shillong and Cherra Punji.

402. *H. hyadaria* (Guén.), Phal. ii., p. 537 (1857).

Marcala ignivorata, Walker, xxvi., p. 1764 (1862).

Shillong and Cherra Punji.

403. *H. venusa*, sp. n.

♂. Of a uniform dark pink brown, with a greenish tinge, antennæ black, forewings with the costal line ochreous, dotted with brown, a dark pink upright line or thin band from the hinder margin before the middle, which bifurcates at the end of the cell, the outer branch outwardly elbowed before reaching the costa hindwing with the costal space pale pinkish, underside pale

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ochreous red, unmarked, darkest on forewings with the hinder marginal space of that wing whitish. Expanse of wings, $1\frac{3}{10}$ inch.

Cherra Punji; one example.

The general colouration above is somewhat similar to that of *H. hyadaria*, Guén.=*ignivorata*, Walk., but the markings are different to any other species of this genus yet recorded. I have very fine series of all the different species of *Hypochrosis* mentioned in this paper; all the females are more or less like each other, but can easily be separated; the males are very distinct, and I have never seen any intermediates.

404. *H. abstractaria* (Walker), xxxv., p. 1559 (1866).

Marcala irrorata, Moore, Descr. Ind. Lep. Atk., iii., p. 232 (1887).

Shillong and Cherra Punji; common. A somewhat variable insect; many of the examples have black patches on the hinder margin near the angle of various sizes, some of them very large.

405. *H. obliquaria* (Moore), *l.c.*

Shillong and Cherra Punji; very common.

406. *H. festivaria* (Fabr.), Ent. Syst., iii., 2, 152, 84 (1793).

Geometra saturataria, Walker, xxii., p. 519 (1861).

Cherra Punji.

407. *H. iris* (Butler), Ann. Mag. N. H. (5), vi., p. 122 (1880).

Cherra Punji.

Genus Achrosis, Guén.

408. *A. quadraria*, Warren, P. Z. S., 1893, p. 409.

Cherra Punji.

Genus Prionia, Hübner.
Osicerda, Walker.
Celesdera, Walker.
Ismisca, Walker.
Zomia, Moore.

409. *P. incitata* (Walker), xxiv., p. 1085 (1862).

Zomia miscella, Swinh., Trans. Ent. Soc., 1891, p. 144.

Shillong and Cherra Punji.

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410. *P. squalidaria*, Hübner, Zutr., iv., p. 40, figs. 787, 788, ♀ (1832).

P. squalidaria, Cotes and Swinh., Cat. Moths of India, iv., No. 3691 (1888).

Ismisca cyclogonata, Walker, xxvi., p. 1765 (1862).

Shillong; a fine series.

411. *P. costimaculata* (Moore), P. Z. S., 1867, p. 650.

Shillong.

412. *P. trinotaria* (Moore), *l.c.*

Cherra Punji; one example, much smaller than usual.

413. *P. intexta* (Swinh.), Trans. Ent. Soc., 1892, p. 145, pl. 8, fig. 11.

Shillong.

Genus Heteromiza, Warren.

414. *H. flava* (Moore), Descr. Ind. Lep. Atk., iii., p. 233, pl. 8, fig. 5 (1887).

Shillong.

415. *H. sanguiflua* (Moore), *l.c.*, fig. 4.

Shillong.

416. *H. cruentaria* (Moore), P. Z. S., 1867, p. 616.

Cherra Punji.

Genus Nadagara, Walker.

417. *N. inordinata*, Walker, xxiv., p. 1094 (1862).

Shillong. The type from Sarawak is in the O. M. I have received two males from Shillong which are identical with Bornean and Maylayan specimens.

Genus Eilicrinia, Hübner.

418. *E. flava* (Moore), Descr. Ind. Lep. Atk., iii., p. 233, pl. 8, fig. 2 (1887).

Shillong.

Genus Spilopera, Warren.
Erinnis, Warren.

419. *S. umbrata*, Warren, P. Z. S., 1893, p. 403.

Cherra Punji.

Closely allied to *S. gracilis*, Butler, from Japan, uniformly smaller, and differing in the disposition of the bands.

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420. *S. hepaticata*, sp. n.

♂. Chocolate-brown, wings smeared with whitish in parts, a black dot at the end of each cell, forewings with a straight transverse brown line one-third from base, an irregular sinuous brown line from costa of forewings near apex to hinder margin, one-fourth from the angle, continued on the hindwings, where it is discal and curved, corresponding to the curves of the outer margin, the portion of the wings outside this line is darker and suffused towards the apex of forewings with a red tint, and there is a white smear on the outer margin below the apex and another smear in the disc below it. Underside paler, uniform in colour, suffused with grey, the cell dots distinct and both wings crossed by a discal sinuous chocolate line. Expanse of wings, $1\frac{5}{16}$ inch.

Cherra Punji; two examples.

421. *S. combusta*, Warren, P. Z. S., 1893, p. 415.

Cherra Punji.

422. *S. obliquilinea* (Moore), Descr. Ind. Lep. Atk., iii., p. 229 (1887).

Leptomiza straminea, Warren, P. Z. S., 1893, p. 407, ♀.

Shillong and Cherra Punji.

The type of Warren's genus *Leptomiza* is *calcearia*, Wk. Of the three new species he describes in the same paper all are from female types, and it is impossible to tell what genus they really belong to until the males are examined; out of one hundred and seventy-four new species described in this paper, no less than fifty-four are erected on female types, and of many of them he appears to have had only single specimens before him.

Genus Fascellina, Walker.

423. *F. chromotaria*, Walker, xx., p. 215, ♀ (1860).

Geometra usta, Walker, xxxv., p. 1602, ♂ (1866).

Shillong and Cherra Punji; common.

424. *F. plagiata* (Walker), xxxv., p. 1601 (1866).

F. viridis, Moore, P. Z. S., 1867, p. 79, pl. 7, fig. 4.

Shillong.

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425. *F. subsignata,* Warren, P. Z. S., 1893, p. 399.

F. curtaca, Swinh., Ann. Mag. N. H. (6) xii., p. 220 (1893).

Shillong.

426. *F. dacoda,* Swinh., *l.c.*, p. 221. (Pl. II., fig. 7.)

Shillong and Cherra Punji.

427. *F. cyanifera,* sp. n. (Pl. II., fig. 13.)

♂ ♀. Chocolate-brown suffused with ochreous, and smeared and striated in parts with white; forewings with two indistinct brownish transverse straight bands, first one-third from base, second in the middle; a thin white line, edged with brown on both sides, and more or less sinuous, extending from a white subapical patch on costa of forewings to hinder margin, one-fifth from the angle, and continued across the disc of the hindwings, where it is bent at its centre; inside this line on the hindwings is a broad chocolate-brown band, and outside it on both wings are several white smears; on the underside the body, legs, and wings are ochreous, wings striated with brown, suffused with white and yellow on forewings, uniformly bright ochreous on hindwings; on the forewings, a white line edged with brown runs from the costa of forewings where it is deeply elbowed outwards, and then nearly straight down to the hinder angle, one-third from the angle, a broad reddish-brown band on its innerside, narrowing downwards, and all the wing outside the line of the same colour and smeared with white in parts; the hindwings are crossed by two discal brown lines, the inner one bent in its middle. Expanse of wing, ♂ $1\frac{4}{10}$, ♀ $1\frac{5}{10}$ inches.

Cherra Punji; one pair.

The female only differs from the male in having rounder wings.

Genus Orsonoba, Walker.

428. *O. clelia* (♀) (Cram.), Pap. Exot., iii., p. 172, pl. 288, figs. B, C. (1780).

O. rajaca (♂), Walker, xx., p. 219 (1860).

O. pallida, Butler, Ann. Mag. N. H. (5), vi., p. 125 (1880).

Cherra Punji.

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Genus Hyposidra, Guén.
Lagyra, Walker.

429. *H. talaca* (Walker), xx., p. 59, ♂ (1860).
Shillong.

430. *H. aquilaria* (Walker), xxvi., p. 1485 (1862).
Shillong.

431. *H. umbrosa* (Swinh.), Trans. Ent. Soc. 1890, p. 203, pl. 7, fig. 4.
Macaria aquilaria (nom præoc.), Walker, xxvi., p. 1562 (1862).
Shillong.

Genus Hyalinetta, Nov.

♂. Differs from *Hyposidra* in having ciliated antennæ, not pectinated as in that genus; veins 3 and 6 of both wings emitted from the ends of the cells, the cells being closed by a hyaline mark bent outwards in the middle.

432. *H. megaspila* (Moore), P. Z. S., 1867, p. 616.
Shillong.

Genus Garæus, Moore.

433. *G. discolor*, Warren, P. Z. S., 1893, p. 400.
Shillong.

Genus Psyra, Walker.

434. *P. cuneata*, Walker, xxi., p. 483 (1860).
Shillong and Cherra Punji.

Genus Crocallis, Treit.
Odontopera, Steph.
Corotia, Moore.
Niphonissa, Butler.

435. *C. translineata* (Walker), Char. Undescr. Lep. Het., p. 93 (1869).
Odontopera nemea, Swinh., Trans. Ent. Soc., 1891, p. 485, pl. 19, fig. 5.
Shillong.

Walker's type is in the Devon and Exeter Museum, and Mr. Warren, who has seen it, says it is identical with my type of *nemea*; Walker described his species as a *Deltoid* of the Genus *Selenis*.

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436. *C. cervinaria* (Moore), P. Z. S., 1867, p. 625, pl. 32, fig. 10.

Shillong.

437. *C. decorata* (Moore), *l.c.*, p. 621, pl. 32, fig. 9.

Shillong.

438. *C. codra* (Swinh.), Trans. Ent. Soc., 1891, p. 486, pl. 19, fig. 8.

Shillong.

439. *C. murina* (Swinh.), *l.c.*, p. 487, pl. 19, fig. 13.

Shillong.

440. *C. heydena*, sp. n.

♂. Dark ochreous grey, forewings densely irrorated with minute dark greyish-brown atoms, a brown dot at the end of the cell, indications of an inner brownish outwardly-curved band at one-third from the base, a nearly straight blackish-brown thick line from the costa near apex to the hinder margin one-fourth from the angle, edged with whitish on the outer side, this line slightly curves inwards below its centre; black points in the interspaces close to the outer margin, cilia brown with pale tips, hindwings pale ochreous-grey, unmarked except for a pale grey dot at end of cell. Underside pale ochreous-grey, a blackish spot at end of each cell, and the discal line showing through the wing. Expanse of wings, $1\frac{7}{10}$ inch.

Shillong; many examples.

Allied to *C. bilineata*, Swinh., which, however, is a larger insect, has a discal band on hindwings and has two teeth below its semi-falcated apex of forewing, a character entirely wanting in all the specimens I have yet seen of this species, the outer margin of the forewing being produced above the middle and evenly concave between that and the apex.

Genus Metrocampa, Latreille.

441. *M. haliaria* (Walker), xxii., p. 518 (1861).

Shillong and Cherra Punji.

Genus Heterolocha, Led.

442. *H. patalata*, Felder, Reise Nov. Lep., pl. 132, fig. 9 (1874).

Marcala varians, Swinh., Trans. Ent. Soc., 1891, p. 487.

Shillong.

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Genus Crocota, Hübn.

443. *C. niguzaria*, Walker, xx., p. 129 (1860).

Shillong; many examples.

Genus Anthyperythra, Swinhoe.

444. *A. hemearia*, Swinh., Trans. Ent. Soc., 1891, p. 485, pl. 19, fig. 9.

Shillong.

Genus Hyperythra, Guén.

445. *H. lutea*, Cram., Pap. Exot., iv., pl. 370 figs. c, d. (1781).

Common.

Genus Pseuperythra, Nov.

Differs from *Hyperythra* in the absence of the sexual patch of *androconia* on forewing, the cell being longer in both sexes.

446. *P. phœnix* (Swinh.), Trans. Ent. Soc., 1890, p. 489.

Shillong; a long series.

447. *P. khasiana* (Swinh.), Ann. Mag. N. H. (6), xii., p. 221 (1893).

Shillong; many examples: the females of the above two species are rather difficult to distinguish from the females of *Hyperythra lutea*; they have, however, large purplish spots all along the outer side of the discal band on both wings, whereas in *lutea* these spots are duller coloured and more restricted; the cell also is shorter in *lutea*: from each other they can be separated by the difference in the colouration of the underside.

Genus Scardamia, Guén.

448. *S. metallaria*, Guén., Phal., i., p. 89 (1857).

Shillong and Cherra Punji.

Genus Peratophyga, Nov.

Antennæ of male with paired ciliations to the tips; of the female with very minute ciliations; palpi upturned, covered with hairs; hindwings with vein 4 curving downwards before end of cell, 2 emitted from middle of cell, 3 and 6 from the ends, forewing with

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vein 3 from end of cell, 5 emitted from 6 beyond end of cell, mid tibia with two terminal spurs, hind tibia with four.

449. *P. ærata* (Moore), P. Z. S., 1867, p. 643.
Shillong.

Genus Hypulia, Nov.

♀. Antennæ dilate, palpi upturned, last joint short, depressed, smooth; hindwings with vein 3 emitted before end of cell, 6 at the end, 2 beyond the middle; forewing with vein 3 before end of cell, 5 in the centre of discocellulars, 6 bent at its origin before upper end; hind tibiæ with two pairs spurs, one long and one short in each pair.

450. *S. dirempta* (Walker), xxii., p. 595 (1861).

Shillong and Cherra Punji: I have this species from several parts of India and from Singapore, all females, and have never seen a male.

Genus Pericallia, Stephens.

451. *P. gynopteridia* (Butler), Ann. Mag. N. H. (5), vi., p. 123 (1880).

Shillong and Cherra Punji; many examples of both sexes.

452. *P. angulifascia* (Moore), P. Z. S., 1878, p. 851, pl. 53, fig. 11.

Shillong; several males and one female. In this species vein 6 of the hindwings is emitted a little further inwards from the end of the cell then in *gynopteridia*, and the antennæ of the female has the pectinations very short and invisible to the naked eye.

Genus Epione, Dup.

453. *E. adustata*, Moore, *l.c.*, pl. 8, fig. 20.

Type Khasia Hills in coll. Staudinger: not known to me.

Genus Synegia, Guén.
Borbacha, Moore.
Parasynegia, Warren.

454. *S. pardaria* (Guén.), Phal., i., p. 420 (1857).
Shillong.

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455. *S. camptogrammaria* (Guén.), Phal., i, p. 420 (1857).
Caberodes inflexaria, Walker, xxvi., p. 1513 (1862).
Shillong and Cherra Punji.

456. *S. diffusaria* (Moore), P. Z. S., 1867, p. 641.
Anisodes punctifera, Butler, Ann. Mag. N. H. (5), vi., p. 220 (1880).
Cherra Punji.

457. *S. pluristriaria* (Walker), xxvi., p. 1581 (1862).
Shillong and Cherra Punji; common.

458. *Synegia gopterana*, sp. n.

♂. Ochreous, sparsely irrorated with red, thorax with a red band in front; abdomen with segmental bands, wings with a black dot at the end of each cell, hindwings with a short basal red band, and a corresponding thick red band near the base of the abdomen, both wings crossed by a red band from the centre of the abdominal margin of hindwings, where it is double, to the apex of forewings, where it joins a band which curves from the apex to the costal third; on the forewings there is another curved band attached to the upper half of the medial band and a red mark against the centre of the outer margin, and on the hindwings there are some irregular red lines in the disc and a straight red band from the apex to the anal angle. Expanse of wings, $1\frac{2}{10}$ inch.

Cherra Punji; two examples.
Allied to *S. lidderdalii*, Butler.

Genus Corymica, Walker.

459. *C. arnearia*, Walker, xx., p. 231 (1860).
Shillong.

460. *C. caustolomaria*, Moore, Descr. Ind. Lep. Atk., iii., p. 231 (1887).
Cherra Punji.

Section IV. MACARIINÆ.

Genus Luxiaria, Walker.
Bithia, Walker.

461. *L. phyllosaria* (Walker), xx., p. 82 (1860).
L. alfenusaria, Walker, *l.c.*, p. 232.
Shillong.

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462. *L. contigaria* (Walker), xxii., p. 754 ♀ (1861).

Acidalia turpisaria, Walker, xxiii., p. 771 ♀ (1861).
A. tephrosaria, Moore, P. Z. S., 1867, p. 643 ♂.

Very common.

463. *L. subrasata* (Walker), xxiii., p. 773 (1861).

Shillong and Cherra Punji; a fine series.

Forewings very narrow; underside ochreous-brown with the usual markings brown, and with a white patch at apex of forewing.

464. *L. submonstrata* (Walker), xxiii., p. 772 (1861).

Shillong and Cherra Punji; many examples

The smallest species of the genus, of a pale grey colour.

465. *L. fasciosa*, Moore, Descr. Ind. Lep. Atk., iii., p. 254 (1887).

Shillong and Cherra Punji; common.

466. *L. exclusa* (Walker), xxi., p. 320 (1860).

L. exclusa, Cotes and Swinh., Cat. Moths of India, iv., No. 4006 (1888).
Acidalia inexactata, Walker, xxxv., p. 1600 (1866).

Shillong.

467. *L. obliquata*, Moore, Descr. Ind. Lep. Atk., iii., p. 254 (1887).

Shillong and Cherra Punji; many examples.

Genus MACARIA, Curtis.
Acadra, Herr Schäff.
Evarzia, Walker.
Azata, Walker.
Gubaria, Moore.
Gonodela, Boisd.

468. *M. emersaria* (Walker), xxiii., p. 925 (1861).

Shillong and Cherra Punji; common.

469. *M. oliva*, sp. n. (Pl. II., fig. 16.)

♂. Olive grey, with slightly darker irrorations; wings crossed by olive brown lines, all bent in on to the costa of forewings, 1st

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[illegible]

[illegible] ... Ann. ... Ash., iii., [illegible]

[illegible] common form of the [illegible] but I have never received it from any other locality.

474. *M.* [illegible] Swinh., Ann. Mag. N. H. (6), xii., p. [illegible]

Shillong; five males.

475. *M. apataria* Swinh., l. c., p. 222.

Shillong and Cherra Punji; twelve males.

476. *M. metagonaria* (Walker), xxvi., p. 1518 (1862).

Common; in the B. M. Coll. this is made a synonym of *S. elvirata*, Guén., but *elvirata* belongs to the *sufflata* group. I have it from the Shan States; it is the largest species of that group.

477. *M. xanthonora*, Walker, xxiii., p. 935 (1861).

Shillong; many examples.

478. *M. inchoata*, Walker, xxiii., p. 931 (1861).

M. nora, Walker, *l.c.*, p. 934.
M. neonora, Walker, *l.c.*

Very common; *neonora* is from the Philippines, it has the central white band very broad, but I have an example from the Khasias identical with the type. The type specimen of *inchoata* is a female; some females of this extreme form look very distinct, but among the many hundreds in my museum, from many localities, there are all three forms with all the gradations between them.

479. *M. fasciata* (Fabr.), Syst. Ent., p. 629 (1775).

Shillong; appears to be more rare in the Khasias than any other species of this group, only three or four examples having been received.

480. *M. acutaria*, Walker, Char. Undescr. Lep. Het., p. 100 (1869).

Shillong and Cherra Punji; many examples. There are two distinct forms of this species, one much darker than the other.

481. *M. perspicuaria*, Moore, P. Z. S., 1867, p. 647.

Shillong and Cherra Punji; common.

482. *M. odataria* (Swinh.), Ann. Mag. N. H. (6), xii., p. 154 (1893). (Pl. II., fig. 17.)

Shillong; five examples.

483. *M. trilinearia* (Moore), Descr. Ind. Lep. Atk., iii., p. 263 (1887).

Shillong.

484. *M. quadraria* (Moore), Lep. Ceylon, iii., p. 469, pl. 205, fig. 1 (1887).

Azata ferruginata, Moore, *l.c.*, p. 470, fig. 2.

Shillong; many examples.

485. *M. subfasciata* (Hampson), Ill. Typ. Lep. Het. B. M., viii., p. 112, pl. 151, fig. 20 (1891).

Shillong; nine examples.

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[illegible] on the

[illegible]

[illegible] with the costa tinged with [illegible] three transverse [illegible] the first acutely bent [illegible] outward from the costa [illegible] outwards from the [illegible] across the mid- [illegible] with whitish, with [illegible] the hindwings are [illegible]

[illegible]

[illegible] from Sikkim.

[illegible]

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Z. aureata, Moore, Descr. Ind. Lep. Atk., iii., p. 263, ♂ (1887).

Cherra Punji.

Section V. ABRAXINÆ.
Zereninæ.

Genus CISTIDIA, Hübner.
Halthia, Mén.
Obeidia, Walker.

493. *C. nigripars* (Swinh.), Trans. Ent. Soc., 1892, p. 16, pl. 1, fig. 1.

Shillong; one example.

494. *C. lucifera*, sp. n.

♂ ♀. Head and body ochreous, thorax with brown spots, abdomen with brown segmental bands, wings white, with a broad band on all the margins, the bands are ochreous, spotted with brown in some examples, but in others the band is brown marked with ochreous. In some examples, especially in the females, the bands are macular, much as in the Chinese species, *C. tigrata*, Guén. On the hindwing there is also a brown macular band. Expanse of wings, ♂ $2\frac{8}{10}$, ♀ 3 inches.

Types, India, ♂ ♀ in O. M.

Shillong; one female. I have it also from Sikkim. Differs from *C. tigrata* in its smaller size, and the colour of the wings being pure white instead of ochreous.

Genus PARICTERODES, Warren.

495. *P. tenebraria* (Moore), P. Z. S., 1867, p. 653.

Shillong.

Genus ICTERODES, Butler.

496. *I. hamiltonia* (Swinh.), Trans. Ent. Soc., 1892, p. 17, pl. 1, fig. 15.

Shillong.

497. *I. lapsariata* (Walker), xxiv., p. 1121 (1862).

Cherra Punji.

498. *I. fasciata*, sp. n. (Pl. II., fig. 11.) ♀.

♂ ♀. Pectus, palpi beneath and shafts of the antennæ ochreous, plumes and upper side of palpi black, abdomen ochreous with black spots, wings white with broad grey transverse bands, one at

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the base where there are some ochreous marks, an incomplete band in the middle, obsolescent in the hindwings, followed by a broad discal band across both wings, and an almost equally broad marginal band with a white sinuous line running down its centre. Body and legs below ochreous. Expanse of wings, 2 inches.

Cherra Punji. I have it also from Kurseyong.

Genus Calcula, Moore.

499. *C. exanthemata*, Moore, Descr. Ind. Lep. Atk., iii., p. 266 (1887).

Shillong.

Genus Abraxas, Leach.

500. *A. leopardina* (Kollar), Hüg. Kasch., iv., p. 490 (1848).

A. martaria, Guén., Phal. ii., p. 205 (1857).
A. intermedia, Warren, P. Z. S., 1888, p. 324.

Shillong and Cherra Punji; very common: it is impossible to separate the above three. Amongst the hundreds I have received from the Khasias there are typical examples of all three, and very many intergrades; it is a species very variable in both pattern and size.

501. *A. khasiana*, Swinh., Trans. Ent. Soc., 1892, p. 17.

Shillong; five examples.

Genus Percnia, Guén.

502. *P. felinaria*, Guén., Phal., ii., p. 216, pl. 19, fig. 1 (1857).

Common; I have two or three curious sports of this species from Cherra Punji.

503. *P. belluaria*, Guén., *l.c.*, p. 217.

Very common.

504. *P. guttata*, Felder, Reise Nov. Lep., pl. 130, fig. 15 ♂ (1874).

P. submissa, Warren, P. Z. S., 1893, p. 391.

Shillong; three examples. I have it also from Simla and Kurseyong, the antennæ of the male is quite different in this species to that in *felinaria* or *belluaria*, having well separated thick spine-like branches densely ciliated.

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505. *P. coryneta*, sp. n.

♂. White, pectus, top of head and thorax ochreous; abdomen grey tinged with ochreous; the two latter with black spots as in *Percnia*; forewings ochreous at the base, both wings with spots much as in *P. felniaria*, but there are black streaks at the base of veins 3, 4, 5 and 6 of the forewings, and the sub-marginal row of spots are in pairs, except those in the 2nd and 3rd interspaces; and these spots being somewhat near the margin they leave a white discal band between them, and the central duplex row; in the hind-wing the central band of spots are in pairs in the middle, being near the origin of veins 3 and 4, and 6 and 7, these being emitted from the lower and upper ends of the cell. Expanse of wings, $2\frac{4}{15}$ inch.

Shillong; one example.

Genus MILIONIA, Walker.

506. *M. pulchrinervis*, Felder, Reise Nov. Lep., pl. 104, fig. 6 ♀ (1868).

M. lativitta, Moore, P. Z. S., 1872, p. 570.

Shillong.

Section VI. BOARMIINÆ.

Genus AMRAICA, Moore.

507. *A. recursaria* (Walker), xxi., p. 374 ♀ (1860).

Boarmia ferrolavata, Walker, xxvi., p. 1536 ♀ (1862).

B. soliragaria, Walker, xxxv., p. 1586 ♀ (1866).

A. fortissima, Moore, Descr. Ind. Lep. Atk., iii., p. 245 ♂ (1887).

Shillong; a fine series. The above is a very good instance of the futility of erecting types on female examples in the Geometers: the above three females all vary *inter se*, but are all undoubtedly one species, easily proved by the examination of a long series of this species.

Genus EUBYJA, Hübn.
Amphidaris, Treit.

508. *E. regalis* (Moore), Descr. Ind. Lep. Atk., iii., p. 234 (1887).

Shillong.

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Genus Cusiala, Moore.

509. *C. bengalaria* (Guén.), Phal., i., p. 210, pl. 4, fig. 2 (1857).

Shillong; many examples of both sexes.

510. *C. contectaria* (Walker), xxvi., p. 1529 (1862).

Shillong and Cherra Punji.

511. *C. angulata* (Hampson), Ill. Typ. Lep. Het. B. M., viii., p. 107, pl. 150, fig. 7 (1891).

Cherra Punji.

Genus Buzura, Walker.

512. *B. suppressaria* (Guén.), Phal., i., p. 210 (1857).

B. multipunctaria, Walker, xxvi., p. 1531 (1862).
B. strigaria, Moore, P. Z. S., 1879, p. 416.

Shillong and Cherra Punji; common.

Genus Chorodna, Walker.

513. *C. erebusaria*, Walker, xxi., p. 314 (1820).

Shillong and Cherra Punji.

514. *C. metaphæaria* (Walker), xxvi., p. 1482 (1862).

Erebomorpha semiclusaria, Walker, *l.c.*, p. 1552.
E. prætextata, Felder, Reise Nov. Lep., pl. 126, fig. 16 (1874).

Shillong.

515. *C. testaceata* (Moore), P. Z. S., 1867, p. 615.

Cherra Punji.

Genus Erebomorpha, Walker.
Vindusara, Moore.

516. *E. fulgurita*, Walker, xxi., p. 495 (1860).

E. xanthosoma, Felder, Reise Nov. Lep., pl. 126, fig. 17 (1874).

Shillong; many examples.

517. *E. fulguraria*, Walker, xxi., p. 495 (1860).

Shillong; seven examples.

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518. *E. compositata* (Guén.), Phal. ii., p. 207 (1857).
Common.

Genus Opthalmodes, Guén.

519. *O. herbidaria*, Guén., Phal., i., p. 283 (1857).
O. diurnaria, Guén., *l.c.*, p. 284.
Boarmia pertusaria, Felder, Reise Nov. Lep., pl. 125, fig. 17 (1874).
Shillong and Cherra Punji.

520. *O. infusaria*, Walker, xxi., p. 448 (1860).
Shillong and Cherra Punji; very common.

521. *O. pulsaria*, Swinh., Trans. Ent. Soc., 1891, p. 489.
Shillong and Cherra Punji; many examples.

522. *O. cordularia*, Swinh., Ann. Mag. N. H. (6), xii., p. 155 (1893). (Pl. II., fig. 4.)
Shillong and Cherra Punji.

Genus Amblychia, Guén.

523. *A. angeronaria*, Guén., Phal., i., p. 215, pl. 4, fig. 9 (1857).
Shillong.

Genus Elphos, Guén.

524. *E. hymenaria*, Guén., Phal., i., p. 285, pl. 16, fig. 4 (1857).
E. pardicelata, Walker, xxvi., p. 1544 (1862).
E. præumbrata, Warren, P. Z. S., 1893, p. 433 ♀.
Shillong; common. Warren's species is erected on a female from Perak: in the Oxford Museum and in my own museum are examples from several parts of India, Borneo, Sumatra and Singapore, with many variations of females bearing many of the characters described by Warren.

525. *E. scolopaiea*, Drury, Exot. Ins., ii., pl. 22 fig. 1, App. ii. (1773).
Shillong; common.

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Genus Boarmia, Treit.

526. *B. admissaria*, Guén., Phal. i., p. 239 (1857).

B. pleniferata, Walker, xxvi., p. 1538 (1862).
Alcis vicina, Moore, Descr. Ind. Lep. Atk., iii., p. 243 (1887).

Shillong. A splendid series of this very variable species.

527. *B. perspicuata*, Moore, P. Z. S., 1867, p. 630.

Shillong.

528. *B. alienaria*, Walker, xxi., p. 370, ♂ (1860).

B. gelidaria, Walker, xxvi., p. 1537, ♀ (1862).
Chogada fraterna, Moore, Descr. Ind. Lep. Atk., iii., p. 245 (1887).

Shillong and Cherra Punji; very common; a very widely distributed species: I have it from Sylhet, Sikkim, Khasias, Andamans, Nilgiris, and Ceylon.

529. *B. propulsaria*, Walker, xxi., p. 385 (1860).

B. contiguata, Moore, P. Z. S., 1867, p. 631.

Shillong and Cherra Punji; common.

530. *B. semiclarata* (Walker), xxiv., p. 1029 (1862).

Shillong; many examples.

531. *B. semialba* (Moore), Descr. Ind. Lep. Atk., iii., p. 241 (1887).

Cherra Punji.

532. *B. latifasciata*, Warren, P. Z. S., 1893, p. 427.

Cherra Punji.

533. *B. nebulosa*, Swinh., Trans. Ent. Soc., 1891, p. 488.

Shillong.

534. *B. ratotaria*, sp. n. (Pl. II., fig. 18.)

♂. Brown; the colour caused by minute brown irrorations densely packed on a grey ground; wings with a lunular-shaped ringlet at the end of each cell, and crossed by several dark-brown lines, 1st one-third from base, and indistinct; 2nd medial, outwardly dentated, regularly curved on hindwing outside the ringlet,

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double on forewing, the two lines gradually widening on to the costa; 3rd discal somewhat close to the margin, more or less outwardly dentated, and edged in places with whitish on its outer side, marginal sinuous line dark brown; underside pale brown, discal ringlets and central thick black transverse line prominent on both wings. Expanse of wings, $1\frac{6}{10}$ inch.

Shillong and Cherra Punji; many examples. Allied to *B. gemmaria*, Brahm., but differs in the absence of the discal marks, evanescent bands above, and band on hindwings more elbowed outwards.

Genus RACOTIS, Moore.

535. *R. boarmiaria* (Guén.), Phal. i., p. 282 (1857).

Shillong and Cherra Punji. There are two forms, one darker and smaller than the other. It is a very common species in the Khasias.

Genus XANDRAMES, Moore.

536. *X. dholaria*, Moore, P. Z. S., 1867, p. 634.

Shillong and Cherra Punji.

537. *X. latiferaria* (Walker), xxi, p. 445 (1860).

Shillong. Six males. The type came from N. China, but these specimens appear to be identical with the type.

Genus MEDASINA, Moore.

538. *M. strixaria* (Guén.), Phal. i., p. 217 (1857).

Shillong.

539. *M. creataria* (Guén.), *l.c.*

Shillong and Cherra Punji; common.

540. *M. mauraria* (Guén.), *l.c.*, p. 218.

Shillong and Cherra Punji. In Cotes and Swinhoe's "Moths of India," No. 3264, *M. parisnatei* (Walker) is put as a synonym of the above. But this is not correct; *parisnatei* is uniformly much larger than *mauraria*, and has a large pale-yellowish spot in the centre of the outer margin of the forewings in both sexes, besides other differences. I have both sexes from the Chin Hills, and many examples of both sexes of *mauraria* from the Khasias.

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541. *M. nigrovittata* (Moore), P. Z. S., 1867, p. 626.
Shillong and Cherra Punji.

Genus Callocasta, Nov.

♂. Antennæ bipectinated to the tips, pectinations densely ciliated; hindwing with vein 2 emitted from the centre, 3 from a little before end of cell, vein 6 from the upper end; forewing with vein 2 from the centre, 3 from before the end of the cell, 6 bent upwards beyond the upper end of the cell, emitting vein 5 at a little distance beyond; hind tibia with two pairs of spurs.

542. *C. similis* (Moore), Descr. Ind. Lep. Atk., iii., p. 235 (1887).
Shillong.

543. *C. basistrigaria* (Moore), P. Z. S., 1867, p. 626.
Shillong; one female.

Genus Pseudangerona, Moore.

544. *P. separata* (Walker), xxi., p. 381 (1860).
Boarmia retractaria, Walker, *l.c.*, p. 386.
B. intectaria, Walker, xxvi., p. 1535 (1862).
Shillong and Cherra Punji; many examples.

545. *P. reparata* (Walker), xxi., p. 380 (1860).
Shillong; five examples.

546. *P. lectularia* (Swinh.), Trans. Ent. Soc., 1891, p. 489, pl. 19, fig. 4.
Shillong; one example.

Genus Catascia, Hübn.

547. *C. eolaria* (Guén.), Phal., i., p. 294 (1857).
Shillong and Cherra Punji; common.

548. *C. ventraria* (Guén.), Phal., *l.c.*
Shillong and Cherra Punji; common.

Genus Catoria, Moore.

549. *C. sublavaria* (Guén.), Phal., i., p. 256 (1857).

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C. olivescens, Moore, Descr. Ind. Lep. Atk., iii., p. 244 (1887).

Shillong and Cherra Punji. A fine series; typical examples of *sublavaria* and *olivescens* look very distinct, but I have many intergrades.

Genus DARISA, Moore.

550. *D. mucidaria* (Walker), xxxv., p. 1581 (1866).

Shillong and Cherra Punji.

Genus LASSABA, Moore.

551. *L. albidaria* (Walker), xxxv., p. 1582 (1866).

Shillong.

Genus HEMEROPHILA, Steph.
Menophra, Moore.

552. *H. delineata* (Walker), xxi., p. 387, ♀ (1860).

H. canidorsata, Walker, xxxv., p. 1578 (1866).

Shillong.

553. *H. retractaria*, Moore, P. Z. S., 1867, p. 627, pl. 32, fig. 7.

Shillong.

554. *H. humeraria*, Moore, *l.c.*, p. 627.

Shillong.

555. *H. contubernalis* (Moore), Descr. Ind. Lep. Atk., iii., p. 238 (1887).

Shillong.

556. *H. vialis* (Moore), Descr. Ind. Lep. Atk., iii., p. 238, pl. 8, fig. 9 (1887).

Cherra Punji.

Genus HIRASA, Moore.

557. *H. scripturaria* (Walker), xxxv., p. 1590 (1866).

Scotopteryx permuscosa, Warren, P. Z. S., 1893, p. 432.

Cherra Punji.

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Genus Ruttellerona, Nov.

Antennæ of male with short paired bristles; hindwing with cell open, vein 2 at less than one-third from end, rather close to 3; forewing with veination normal, vein 5 in centre of disco-cellulars; mid tibia with one pair terminal spurs; hind tibia with two pairs, the inner pair the longer.

558. *R. cessaria* (Walker), xxi., p. 383, ♂ (1860).
Angerona præclaria, Walker, xxvi., p. 1499, ♀ (1862).
A. pallicostaria, Moore, P. Z. S., 1867, p. 620.
Shillong and Cherra Punji; common.

559. *R. figlina* (Swinh.), Trans. Ent. Soc., 1890, p. 205, pl. 7, fig. 5.
Shillong and Cherra Punji.

Genus Gyadroma, Nov.

♂. Antennæ fasciculate; palpi upturned, first two joints covered with long hairs, last joint short and depressed; wings long, rather narrow; forewing with costa slightly arched, outer margin much rounded; hindwing with outer margin produced and scalloped, both wings with veins 3 and 6 emitted before ends of cells; hind tibia thick, with two pairs of short stout spurs and fringed with long hairs.

560. *G. testacearia* (Moore), P. Z. S., 1867, p. 623.
Shillong and Cherra Punji; in great numbers.

Genus Serraca, Moore.

561. *S. transcissa* (Walker), xxi., p. 380 (1860).
Shillong and Cherra Punji.

Genus Astacuda, Moore.

562. *A. cineracca*, Moore, Descr. Ind. Lep. Atk., iii., p. 244 (1887).
Shillong.

563. *A. ampla*, Moore, *l.c.*
Cherra Punji.

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Genus ECTROPIS, Hübn.

564. *E. dentilineata* (Moore), P. Z. S., 1867, p. 631.

Shillong and Cherra Punji.

565. *E. pallidaria* (Moore), Descr. Ind. Lep. Atk., iii., p. 237 (1887). (Pl. II., fig. 12.)

Pseudocoremia dendrellaria, Swinh., Ann. Mag. N. H. (6), xii., p. 156 (1893).

Shillong.

566. *E. pannosaria* (Moore), P. Z. S., 1867, p. 629.

Shillong.

567. *E. simplaria*, sp. n.

♂. Grey, irrorated with black atoms; abdomen with black dorsal bands, the last two or three duplex; wings crossed by black sinuous and semi-dentate transverse lines, ante-medial, medial, and post-medial, these lines more or less furnished with black points, marginal lunules black; cilia yellowish-grey, with black streaks opposite the veins. Expanse of wings, $1\frac{1}{10}$ inch.

Cherra Punji.

568. *E. planaria*, sp. n.

♂. Grey, striated with brown; the striations thick on the apical portions of the forewings, making them much darker than the rest of the wings; a black lunule at the end of each cell; a sinuated ante-medial transverse brown line more distinct on the hindwings; another similar medial line, bent outwardly on forewings before reaching the costa, an indistinct, pale, very sinuous discal line and marginal black festoon; cilia yellowish-grey, with dark grey patches; underside grey, with the medial line very distinct. Expanse of wings, $1\frac{3}{10}$ inch.

Cherra Punji and Shillong.

Allied to *E. ochrifasciata*, Moore, Lep. Atk., iii., p. 240, but quite distinct.

Genus ASCOTIS, Hübn.

569. *A. selenaria* (Schiff.), Wien. Verz., p. 101.

Boarmia reciprocaria, Walker, xxi., p. 366 (1860).
B. imparata, Walker, *l.c.*, p. 372.
B. promptaria, Walker, *l.c.*, p. 379.

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Ophthalmodes cretacea, Butler, Ann. Mag. N. H., ii., p. 373 (1879).

Shillong and Cherra Punji; common. A very widely-spread species occurring in Africa, India, China and Japan.

Genus ANONYCHIA, Warren.

570. *A. grisea*, Butler, P. Z. S., 1883, p. 172.

Shillong and Cherra Punji.

Genus ARICHANNA, Moore.

571. *A. tramesata*, Moore, P. Z. S., 1867, p. 658, pl. 33, fig. 2.

Shillong.

572. *A. marginata*, Warren, P. Z. S., 1893, p. 423.

Shillong.

573. *A. transfasciata*, Warren, P. Z. S., 1892, p. 425.

Cherra Punji.

Genus SCOTOPTERYX, Hübn.

574. *S. albistellaria*, Warren, P. Z. S., 1893, p. 432.

Type Khasia Hills in collection Elwes.

Genus ORBASIA, Nov.

Antennæ of both sexes simple; hindwing with vein 4 much bent upwards towards end of cell, 2 emitted beyond the middle, 3 before the end, 6 at the upper end; forewing with vein 2 at one-third before end, 3 before the end of the cell, 5 from just above centre of disco-cellular, 6 before upper end of cell; hind tibia with one pair of stout terminal spurs.

575. *O. spurcataria* (Walker), xxvi., p. 1498 (1862).

Shillong; one female.

Genus PSILALCIS, Warren.

576. *P. breta*, Swinh., P. Z. S., 1889, p. 426.

Shillong; in Ill. Typ. Lep. Het. B. M., ix., p. 36, Hampson makes *breta* a synonym of *inceptaria*, Walker, the type of which is a unique and very much rubbed

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female example from Flores, in the Oxford Museum. This is mere conjecture; Flores is a long way from India, and the type specimen is too much rubbed for identification: it does not even resemble *breta*, and until we can find a male we cannot be certain it even belongs to the same genus as *breta*. On this rubbed female Warren states he has erected his genus Psilalcis; but he has erected his genus on a male, and as the male of *inceptaria* is not known, that species cannot stand as the type of the genus.

Explanation of Plate II.

1. *Ocinara cyproba*, p. 154.
2. *Eupterote axesta*, p. 157.
3. *Zamarada cosmiaria*, p. 210.
4. *Opthalmodes cordularia*, p. 215.
5. *Stegania peralba*, p. 195.
6. *Absala dorcada*, p. 170.
7. *Fascellina dacoda*, p. 201.
8. *Myrteta ocernaria*, p. 194.
9. *Episothalma ocellata*, p. 172.
10. *Eustroma monana*, p. 191.
11. *Icterodes fasciata*, p. 211.
12. *Ectropis pallidaria*, p. 221.
13. *Fascellina cyanifera*, p. 201.
14. *Deilinia luteifrons*, p. 193.
15. *Tanaorhinus kina*, p. 174.
16. *Macaria oliva*, p. 207.
17. *Macaria odataria*, p. 209.
18. *Boarmia ratotaria*, p. 216.

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F. C. Moore del. et lith.

Mintern Bros. Chr

Lepidoptera of the

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VII. *An Entomological Excursion to Corsica.* By George C. Champion, F.Z.S.

[Read Feb. 28th, 1894.]

My friend, Mr. R. S. Standen, having determined to make an entomological expedition to the mountains of Corsica, I, at the last moment, decided to accompany him, and, accordingly, we started together on May 28th last, arriving at Ajaccio on the morning of May 30th, and at the hotel at La Foce de Vizzavona, our proposed head-quarters, the same evening. Here we remained about a month, being joined later on by Mr. A. H. Jones, Colonel Yerbury, R.A., Mr. Lemann, and others, Mr. Raine of Hyères having preceded us by some weeks. Altogether, we were quite a large party, all, however, on Lepidoptera intent, myself and Colonel Yerbury excepted. Mr. Standen has already (Ent. 1893, pp. 236—238, and pp. 259—263) given us an account of his experiences with the Lepidoptera (Rhopalocera), for most of which we appeared to be too early, the season in the mountains being very backward compared to the semi-tropical coast region. I devoted myself almost exclusively to the Coleoptera and Hemiptera-Heteroptera; and it is proposed here to give an account of the species met with, adding to my list some others (chiefly Longicornia and Buprestidæ) subsequently obtained by Colonel Yerbury—who remained till August,—which he kindly handed over to me on his return. The Hemiptera-Heteroptera have been entirely determined by Mr. E. Saunders. Our head-quarters at Vizzavona, on the summit of the Col between Bocognano and Tattone, on the main road between Ajaccio and Bastia, at an elevation of about 4,000 feet, and commanding a splendid view of the lofty Mont d'Oro, proved to be a capital centre for collecting. In the immediate vicinity of the hotel, though it is not visible till the summit of the Col is reached, is a splendid forest, composed almost entirely of beech and Corsican pines (*Pinus laricio*), some of the trees being exceedingly lofty, the beech ascending

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higher up the mountain slopes than the pines. The beeches are more or less covered with moss, indicating a humid climate, though the coast region is excessively dry and arid at this season. The forest entirely fills the head of the valley on the northern side of the Col, and in it there was an abundance of fallen timber just ready for the Coleopterist; this being partly due to the fact that a large number of trees had been felled for the purposes of the new railway, which passes in a long tunnel right under the forest. Lower down, on either side of the Col, to Bocognano on the one side, and Tattone on the other, there are plenty of magnificent chestnuts and other trees, with green meadows and small patches of cultivation. Below Bocognano, right down to Ajaccio, the hill-sides are in many places covered with a dense bush or "macchie," chiefly composed of arborescent heath, arbutus, evergreen oak, myrtle, and *Cistus*, with, in the opener places, an abundance of aromatic Labiatæ and other plants. At Ajaccio itself there is the usual semi-tropical vegetation of the Mediterranean region, the abundance and thriving condition of the introduced Opuntias, etc., recalling to my mind visions of distant tropical climes. The mountain slopes for some distance above the limits of the forest are clothed in many places with a dense, almost impenetrable, growth of dwarf alder, such as I have seen nowhere else, the alders coming into flower directly the snow melts, the ground beneath them at this time being bright with crocuses, though no gentians were seen. The mountain summits are more or less serrated, excessively rugged, and barren, and it is not easy to find workable spots, nor, indeed, to get about, many of the ridges being impassable without a long detour. There is also a scarcity of water; even in some of the valleys the streams are small, the Gravone itself being lost in the marsh and sand before reaching the Bay of Ajaccio. In the forest at Vizzavona not many flowering plants were to be seen, beyond foxgloves, a beautiful *Pancratium*, an asphodel, a *Cyclamen* and a *Sambucus*; but lower down at Tattone, etc., there were plenty of Umbelliferæ, Orchidaceæ, Compositæ, etc. Though Monte d'Oro and Monte Retondo were within comparatively easy distance of Vizzavona, I did not attempt an ascent of either of them, contenting myself with working to the summit of the Col between the hotel and Ghisoni, to an elevation of a little over 6,000 feet.

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From Vizzavona, excursions were made to Tattone, Vivario, Corte, Bocognano, Tavera, Ajaccio, etc., the railway helping a good deal for this purpose; but most of the time was spent in the mountains. At Corte, about halfway between Vizzavona and Bastia, in the northern central part of the island, to which we made a pleasant three days' excursion, the heat notwithstanding, there is more water, the united streams, the Restonica and Tavignano, forming a river of considerable size, the banks of which were productive in small Coleoptera. Of the cork-oaks, of which there are forests in some parts of the island, we saw very few in any of the places visited. At Bocognano we received a good deal of assistance and kind hospitality from Dr. Trotter, this place producing many of the species peculiar to the "macchie" and to the low country. Still, my list contains but a meagre assortment of these latter, it being already much too late in the season for most of them, everything being by this time parched up near the coast. One thing struck me as peculiar, viz., the scarcity of *Cryptocephalus*; a similar amount of work in the south of France or Spain would have produced many species.

Corsica contains a large number of Coleoptera peculiar to itself, upwards of two hundred being given in the last European Catalogue (v. Heyden, Reitter, and Weise, 1891) from Corsica alone, the Staphylinidæ and the Rhynchophora each having over thirty peculiar species; and perhaps a still larger number of species are common to Corsica and Sardinia, and which do not extend on to the Italian mainland. One of the most characteristic genera, and one most in evidence, is *Percus* (a close ally of *Pterostichus*), which is represented by several peculiar species, its other members inhabiting Italy, Sardinia, Sicily, the Balearic Islands, and Spain. One abundant insect in the island, *Cetonia aurata*, affords an instance of the extraordinary amount of variation possible within the same species, the different varieties occurring together indiscriminately, and quite irrespective of a varied geographical distribution, or of a difference in altitude of the locality. Two very interesting papers have already been published on the Coleoptera of the island: (1) "Ein entomologischer Ausflug in die Berge Süd-Corsica's," by G. Dieck (Berl. ent. Zeitschr., 1870, pp. 397—404). This exceedingly

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successful collector paid special attention to the Pselaphidæ, Scydmænidæ, Dytiscidæ, etc.; he gives a most interesting account of his entomological experiences in the southern part of the island, where he made excursions with M. Revelière, a well-known Coleopterist residing at that time in Corsica, and to whom we are largely indebted for our knowledge of its insect-fauna. It is to be hoped that some day Dieck's paper will be translated into English and published here, as has already been done with his paper on Andalusia (*cf.* Ent. 1888, pp. 38 *et seq.*). (2), "Notes on some Corsican Insects," by the Rev. T. A. Marshall (Ent. Monthly Mag., vii., pp. 225—228). In this paper Mr. Marshall gives a most accurate description of the general features of the parts of the island he visited, with a list of all the Coleoptera he had captured and been able to name; but no Dytiscidæ or Staphylinidæ are mentioned, nor many of the smaller species. Amongst my captures are many species not noticed by either Dieck or Marshall, and I propose to give here a list of all the species I have been able to identify, adding to my list, as I have stated above, some others subsequently obtained by Colonel Yerbury, chiefly at Tattone, where a saw-mill was started soon after I left. MM. Fauvel and Bedel, the well-known French Coleopterists, have kindly assisted me in determining many of the more obscure species, the former with the Staphylinidæ, the latter with the Carabidæ, Curculionidæ, etc. Representatives of about 510 species were obtained in all, including a good many of the peculiar Corsican forms.

Before commencing my list, it is perhaps as well to give a short account of the general run of species met with in the different localities visited.

At Vizzavona, in the forest, under the bark of the decaying beeches, were to be found *Endophlæus spinulosus, Coxelus pictus, Brontes planatus, Bolitochara lunulata,* etc., in plenty; and *Colydium elongatum, Ipidia quadrinotata,* two species each of *Paromalus* and *Cerylon, Litargus bifasciatus, Orchesia undulata, Melandrya caraboides, Melasis buprestoides, Sipalia scabripennis, Phlœocharis corsica, Placusa,* sp. n. (?), etc., sparingly: in the older trees, with looser bark, *Pterostichus ambiguus* and *Pristonychus carinatus,* both commonly; and in those with plenty of moss and fungi on the bark,

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Platyrrhinus latirostris, Peltis grossa, Diaperis boleti, Triplax rufipes, etc., the first and last-named in numbers. Under the bark of the dead pines, especially of those still standing, *Helops superbus,* a very fine species peculiar to the island, and *H. cæruleus, Menephilus cursipes, Uloma culinaris* and *U. perroudi, Adelocera carbonaria, Elater præustus* and *E. pomonæ,* and *Brachytemnus porcatus,* more or less commonly, and *Tenebrioides maroccanus, Nudobius collaris,* etc., sparingly; on the bark of these trees *Chalcophora mariana* and *Dictyoptera sanguinea* were sometimes to be met with. In recently fallen pines *Acanthocinus griseus, Pogonochærus perroudi, Pissodes notatus,* two species of *Ernobius, Salpingus nitidus, Helops genei,* etc., were to be found on the branches; and in or under the bark, in addition to plenty of *Scolytidæ* and the abundant *Clerus formicarius, Platysoma oblongum,* two species of *Plegaderus, Nemosoma, Aulonium bicolor,* two species of *Corticeus, Clerus quadrimaculatus, Xylita revelièrei,* etc. One specimen of *Lucanus tetraodon* was found in a rotten pine stump (numerous others were subsequently obtained by Colonel Yerbury); and the gigantic larva or pupa of the large Prionid, *Ergates faber,* sometimes occurred in similar situations, or under the bark of the lofty standing dead pines. Three species of the characteristic Carabideous-genus *Percus* were not uncommon under stones, logs, etc., two of them also occurring on the barer mountain sides; a *Telephorus* (*præcox*) frequented the foxgloves; and *Morimus lugubris* was abundant all over the place, it being especially fond of a heap of cut beech logs near the hotel. On the mountain sides a pretty little Malacoderm, *Malachius longicollis,* frequented almost every flower; an *Asida,* a *Thylacites,* some *Harpali,* etc., occurred beneath stones, and *Meloe brevicollis* was occasionally found crawling on the grass. Higher up in the mountains a *Brachyderes* (*analis**) frequented the growing pines; and still higher, on the Col between Vizzavona and Ghisoni, *Otiorrhynchus guttula* swarmed on the alder catkins on sunny calm days, and with it a single specimen of the rare *Ceuthorrhynchus duvali* was obtained; under stones in these high places an *Asida* was abundant, and a second *Otiorrhynchus* (*corsicus*), not uncommon, also one of the species of *Percus* found lower

* Originally recorded from Ajaccio, but certainly in error.

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down; and on the snow, an *Omophlus*. In a very shallow mountain pool, supplied by the melting snow, *Hydroporus griseostriatus* was plentiful, and on its banks were two species of *Bembidium*, also in plenty.

Below Vizzavona, on the road to Bastia, at Tattone, in the meadows, *Cetonia aurata*, showing extraordinary variation in colour—black, blue, green, coppery, green with coppery thorax and scutellum, etc.,—abounded on flowers, and with it were *C. floricola* and *C. morio*, *Trichius zonatus*, *Trichodes*, *Bostrychus capucinus*, *Leptura hastata* and *L. fulva*, *Strangalia bifasciata*, *Stenopterus rufus*, *Agapanthia cardui*, *Clytus rhamni*, *Clytanthus massiliensis*, *Rhagonycha corsica*, *Malachius sardous*, various *Œdemeræ*, etc. In the roads, etc., were found a handsome variety of *Cicindela campestris*, not uncommonly, and *Calosoma sycophanta*, occasionally; also about stercore, *Sisyphus*, *Ateuchus*, *Gymnopleurus*, *Oniticellus*, *Onthophagus schreberi*, *Geotrupes geminatus*—abundant everywhere, even on the higher parts of the mountains where the cattle are pastured in summer,—*Hister inæqualis*, *H. pustulosus*, *H. major*, *H. sinuatus*, etc.

By working downwards on the road to Ajaccio, from Bocognano to Tavera, representatives of a good many interesting species were obtained. In the "macchie," by beating the arborescent heath, evergreen oak, etc., the rare *Cleonus tabidus*, *Caulostrophus delarouzei*, two species of *Nanophyes*, *Metallites parallelus*—one of the commonest weevils in the mountains—*Smicronyx corsicus*, *Pachybrachys scriptus*, *Stylosomus depilis*, two or three species of *Clythra*, etc. By sweeping the scattered flowering plants (most of which were very aromatic) on the slopes and in the meadows lots of Coleoptera came to light, as a *Lixus*, two species of *Cardiophorus*, in plenty, an *Athous*, a *Xyletinus*, two species of *Danacæa* and various other small Malacoderms, *Throscus corsicus*, numerous species of *Bruchus*, *Olibrus*, and *Meligethes*, *Hadrotoma variegata*, *Silaria suturalis*, various *Œdemeræ*, *Gymnetron*, *Anthrenus*, *Omophlus*, *Anthicus corsicus*, *Hispa atra*, etc.

At Ajaccio, *Pimelia sardoa* was abundant all round the sandy shores of the bay on both sides of the town, though more dead than living examples were seen, where also, *Calathus*, *Pedinus*, *Colpotus*, *Cryptic us*, *Dendarus*, *Tentyria*, *Asida*, *Phaleria*, *Chrysomela*, etc., were represented by one or more species; *Ammoph-*

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thorus rufus abounded at the roots of plants; *Capnodis tenebricosa* flew about in the hot sun; *Saprinus semipunctatus* abounded in a dead horse, etc. *Cetonia morio*, two species of *Anthaxia*, an *Acmæodera*, *Stenopterus ater*, *Phytœcia virescens*, a *Coptocephala*, a fine large *Bruchus* (*longicornis*), *Troglops silo*, *Colotes*, etc., occurred on flowers; *Corœbus rubi*, commonly on bramble bushes; *Anthicus corsicus*, swarming on a variety of bushes and trees on the slopes at the back of the town; *Pachypus cornutus* (♂), on the wing in the town towards evening; *Bembidium küsteri* rarely, and *Cicindela littoralis* commonly, at Campoloro, on the sand at the mouth of the Gravone, etc.

At Corte, at an elevation of about 1,300 feet, some interesting small species were to be found on the banks of the Tavignano, as *Lionychus sturmi*, *Tachys apristoides*, *Perileptus*, the very minute *Cryptohypnus meridionalis*, *Anthicus longicollis*, two small blue *Philonthi*, *Lathrobium labile*, *Scopæus*, *Medon*, etc. In the mountain ravines, *Sisyphus*, *Ateuchus*, *Akis punctata*, etc., were common about stercore on the roads; and at a trickling mossy waterfall two *Steni* (*lævigatus* and *strigosus*) occurred sparingly. In the meadows and about the riverside near the town a good many species already met with at Bocognano were to be had by working, with the addition of *Zonitis mutica* and *Larinus latus* on thistle-heads, *Malachius rufus* on Umbelliferous flowers, etc.

List of the Species met with, so far as at present determined.

[Those marked with a * are given from Corsica only in the Catalogue of v. Heyden, Reitter, and Weise.]

Cicindela campestris, L., var. *connata*, Heer, not uncommonly on the main road at Vizzavona, Corte, etc.; one dark specimen, perhaps belonging to the var. *funebris*, Sturm, Corte; *C. littoralis*, F., commonly, on the sandy beach at the head of the Bay of Ajaccio, at the mouth of the River Gravone.

Carabus morbillosus, F., on the beach at Ajaccio; *C. genei*, Thoms.,* fragments of a specimen found at Vizzavona. *Calosoma sycophanta*, L., a few specimens, Vizzavona. *Leistus spinibarbis*, F., Vizzavona. *Bem-*

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bidium bipunctatum, Gyll., and *B. agile*, Duv.,* both commonly, on the banks of a shallow pool in the mountains, at about 5,500 feet elevation, on the Col between Vizzavona and Ghisoni; *B. rufescens*, Guér., Vizzavona; *B. küsteri*, Schaum, on the coast, Ajaccio; *B. concinnum*, Steph., river banks, Corte; *B. nitidulum*, Marsh., Vizzavona; *B. præustum*, Dej., and *B. fasciolatum*, Duftschm., Bocognano. *Tachys apristoides*, Rott., a few specimens beneath shingle on the banks of the River Tavignano, at Corte. *Tachyta nana*, Gyll., rarely, under bark, Vizzavona. *Perileptus areolatus*, Creutz, on the banks of streams, Bocognano and Corte. *Synuchus nivalis*, Panz., Vizzavona. *Calathus circumseptus*, Germ., sea-coast, Ajaccio. *Pristonychus carinatus*, Chaud.,* commonly in the beech-forests at Vizzavona, beneath loose bark. *Pterostichus* (*Adelopterus*) *ambiguus*, Fairm.,* commonly, with the preceding. *Percus reichei*, Kr.,* *P. corsicus*, Dej.,* and *P. loricatus*, Dej.,* under stones, old logs, etc., in the beech-forests, also in bare places on the mountains, Vizzavona, the first-named commonly, the others more rarely; *P. ramburi*, Lap.,* under rotten Opuntias, Ajaccio. *Amara ovata*, F., *A. familiaris*, Duftschm., and *A. trivialis*, Gyll., Vizzavona; *A. striatopunctata*, Dej., on the mountains, Vizzavona. *Harpalus bellieri*, Reiche,* commonly, at Vizzavona, in company with *Percus*; *H. consentaneus*, Dej., *H. distinguendus*, Duftschm., *H. rubripes*, Duftschm., and *H. honestus*, Duftschm., Vizzavona. *Ophonus pumilio*, Dej., Ajaccio. *Anisodactylus binotatus*, F., Vizzavona. *Stenolophus teutonus*, Schr., Vizzavona. *Chlænius vestitus*, Payk,, Ajaccio. *Lebia cyanocephala*, L., Ajaccio. *Lionychus sturmi*, Gené, rarely, beneath shingle, on the banks of the Tavignano, Corte. *Dromius meridionalis*, Dej., and *D. quadrisignatus*, Dej., Vizzavona, the latter not uncommonly, under bark of beech. *Brachinus sclopeta*, F., Ajaccio, on the beach.

Hydroporus griseostriatus, Deg., commonly, and *H. planus*, F., singly, in a shallow pond on the mountains, supplied by the melting snow, on the Col between Vizzavona and Ghisoni, at an elevation of about 5,500 feet; *H. memnonius*, Nicol, and *H. corsicus*, Wehncke?*, singly, in a slightly running stream, Vizzavona. *Agabus bipustulatus*, L., Vizzavona; *A. binotatus*, Aubé, not uncommon, in a small sluggish stream at Vizzavona; *A. conspersus*, Marsh., a single specimen, on the Col

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between Vizzavona and Ghisoni, not differing from examples from the English coast. *Gyrinus natator*, L., Corte and Vizzavona.

Anacæna globulus, Payk., *Hemisphæra infima*, Pand., and *Limnebius perparvulus*, Rey (?), in shallow pools on the sandy banks of streams, Bocognano; *L. picinus*, Marsh. (?) and *Laccobius*, sp., Corte. *Sphæridium scarabæoides*, L., and *S. marginatum*, F., Vizzavona. *Cyclonotum orbiculare*, F., Corte. *Helophorus*, two or three species, Vizzavona. *Elmis oblongus*, Kuw., Bocognano. *Parnus intermedius*, Kuw., in plenty, on the banks of a stream, Bocognano.

Oxalea castanea, Er. (?), Vizzavona. *Aleochara spissicornis*, Er., Vizzavona; *A. mœsta*, Grav., Corte. *Ocyusa picta*, Rey,* *Haploglossa pulla*, Gyll., *Homalota nigricornis*, Thoms., *Oxypoda referens*, Rey, and *O. fusina*, Rey, fortuitously, Vizzavona. *O. alternans*, Grav., in fungus, Vizzavona. *Phlœopora reptans*, Grav., *P. transita*, Rey, and *P. corticalis*, Grav., *Ischnoglossa prolixa*, Grav., and *I. corticina*, Er., *Leptusa fumida*, Er., and *L.* (*Sipalia*) *scabripennis*, Rey,* *Placusa*, sp. n. (?), *Homalota cuspidata*, Er., *Conurus pubescens*, Payk., sparingly, under bark of beech or pine, Vizzavona. *Homalota fragilis*, Kr., on the banks of the Tavignano, Corte. *Bolitobius trimaculatus*, var. *kraatzi*, Pand., in plenty in fungus on an old dead beech, Vizzavona. *Gyrophæna* sp. (?), *G. manca*, Er., and *G. boleti*, Linn., in fungus on beech, Vizzavona. *Bolitochara obliqua*, Er., in plenty, and *B. lunulata*, Payk., rarely, under bark of beech, Vizzavona. *Quedius impressus*, Panz., Corte. *Ocypus olens*, Müll., and *O. cyaneus*, Payk., in the road, Vizzavona. *Philonthus alcyoneus*, Er., and *P. luxurians*, Er., beneath shingle on the sandy banks of the Tavignano, Corte. *P. nigritulus*, Grav., Corte. *Actobius prolixus*, Er., banks of streams, Bocognano and Corte. *Lathrobium labile*, Er., rarely, with the *Philonthi* at Corte, on the banks of the Tavignano. *Xantholinus fulgidus*, Fabr., Corte. *Nudobius collaris*, Er., a few specimens under beech-bark, Vizzavona. *Medon nigritulus*, Er., banks of streams, Bocognano. *Scopæus minutus*, Er., banks of the Tavignano, Corte. *Stenus lævigatus*, Rey, about running water, on mossy stones, Vizzavona and Corte; *S. strigosus*, Fauv.,* in company

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with the preceding, Corte; *S. ater*, Mann., Corte; *S. asphaltinus*, Er., Vizzavona and Bocognano; *S. fuscicornis*, Er., and *S. erichsoni*, Rye, Vizzavona. *Trogophlæus arcuatus*, Steph., Bocognano; *T. corticinus*, Grav., Ajaccio; *T. pusillus*, Grav., Vizzavona. *Homalium florale*, Payk., *H. fossulatum*, Er., *H. pusillum*, Grav., and *H. vile*, Er., Vizzavona; *H. concinnum*, Marsh., Bocognano. *Anthobium tempestivum*, Er., Vizzavona. *Phlœocharis corsica*, Fauv.,* under bark of beech, very rare, Vizzavona.

Bryaxis revelierei, Saulcy (?), on the banks of streams, Corte and Bocognano. *Euplectus punctatus*, Muls., under bark, Vizzavona. *Neuraphes dubius*, Reitt.,* under bark, Vizzavona, very rare.

Silpha granulata, Thunb., in the road, Vizzavona. *Liodes humeralis*, Kug., in fungoid growth on beech, Vizzavona. *Arthrolips* sp., Corte and Ajaccio. *Trichopteryx*, sp., Vizzavona. *Sphærius acaroides*, Waltl, on the sandy banks of the Tavignano, Corte. *Cybocephalus*, sp. (?), Corte. *Phalacrus coruscus*, Panz., Bocognano. *Olibrus stierlini*, Flach, Ajaccio and Bocognano; *O. biplagiatus*, Guill., Ajaccio; *O. affinis*, Sturm, Bocognano. *Triplax rufipes*, F., in plenty, in fungus on beech, Vizzavona. *Endomychus coccineus*, L., under bark of beech, Vizzavona. *Cryptophagus dentatus*, Herbst, *C. distinguendus*, Sturm, and *C. scanicus*, L., Vizzavona. *Enicmus minutus*, L., Vizzavona; *E. testaceus*, Steph., and *E. hirtus*, Gyll., one specimen of each under beech-bark, Vizzavona; *E. transversus*, Oliv., Corte. *Lathridius productus*, Rosenh., Ajaccio, one specimen. *Corticaria pubescens*, Gyll., *C. obscura*, Bris. (?), and *C. gibbosa*, Herbst, Vizzavona. *Litargus bifasciatus*, F., under bark of beech, Vizzavona. *Mycetophagus quadripustulatus*, L., including the var. *bipustulatus*, Schilsky, in fungus on beech, Vizzavona. *Ipidia quadrinotata*, F., rarely, under bark of beech, Vizzavona. *Meligethes æneus*, F., and three other spp., Bocognano. *Pityophagus ferrugineus*, L., *Rhizophagus depressus*, F., and *R. ferrugineus*, Payk., under bark of *Pinus laricio*, Vizzavona. *Nemosoma elongatum*, L., one specimen, on the bark of a fallen pine, Vizzavona. *Tenebrioides mauroccanus*, Reitt., not very rarely, under bark of pines, Vizzavona. *Peltis grossa*, L., one specimen, in moss on

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the trunk of a dead beech, Vizzavona. *Coxelus pictus*, Sturm, abundant, *Endophlœus spinulosus*, Latr., rather commonly, *Colydium elongatum*, F., rarely, *Ditoma crenata*, F., rarely, and *Brontes planatus*, L., in plenty, beneath the bark of decaying beeches, Vizzavona. *Aulonium bicolor*, Herbst, commonly, in the burrows of Scolytidæ, in the bark of pines, Vizzavona. *Cerylon histeroides*, F., and *C. ferrugineum*, Steph., under bark of beech, Vizzavona. *Læmophlœus pusillus*, Schönh., and *Silvanus unidentatus*, Oliv., rarely, under bark, Vizzavona. *Dermestes vulpinus*, F., Ajaccio. *Hadrotoma variegata*, Küst., on flowers, not rare, Ajaccio, Bocognano, Vizzavona, Tattone, Vivario. *Anthrenus varius*, F., and *A.* sp. (?), common, on flowers, Ajaccio, Bocognano, etc. *Limnichus incanus*, Kies., Corte.

Platysoma oblongum, F., *Plegaderus saucius*, Er., and *P. sanatus*, Truqui, all three not uncommonly, beneath or in the bark of pines, apparently preying on the larvæ of Scolytidæ, Vizzavona. *Hister major*, L., *H. inæqualis*, Oliv., *H. 4-maculatus*, L., *H. cadaverinus*, Hoffm., *H. sinuatus*, F., and *H. purpurascens*, Herbst, on the roads, in dung, etc., Vizzavona; *H. pustulosus*, Gené, Bocognano. *Saprinus semipunctatus*, F., commonly, and *S. furtus*, Er., rarely, under a dead horse, on the beach, Ajaccio; *S. chalcites*, Ill., under dung in the road, Ajaccio. *Paromalus parallelopipedus*, Herbst, and *P. flavicornis*, Herbst, under bark of beech, Vizzavona.

Lucanus tetraodon, Thunb., a single ♂, found in a rotten pine-stump, and another example seen on the wing, flying about the top of a tree, June 27th, Vizzavona; subsequently found in some numbers by Colonel Yerbury. *Dorcus parallelopipedus*, L., in rotten beech, etc., Vizzavona, not uncommon. *Ateuchus pius*, Ill., in the roads, Bocognano and Tattone; *A. laticollis*, L., abundant about dung, Corte, Tattone, Vizzavona, Ajaccio, etc. *Sisyphus schæfferi*, L., abundant, with the preceding. *Gymnopleurus sturmi*, Macl., Ajaccio; *G. mopsus*, Pall., Vizzavona. *Onthophagus amyntas*, Oliv., *O. taurus*, Schr., *O. nuchicornis*, L., *O. fracticornis*, Preyssl., and *O. schreberi*, L., *Oniticellus flavipes*, F., Vizzavona, Corte, etc. *Aphodius erraticus*, L., *A. pusillus*, Herbst, *A. scrofa*, F., *A. hæmorrhoidalis*, L., Vizzavona. *Geotrupes geminatus*, Gené, abundant every-

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where in the mountains, at an elevation of 2,500 feet and upwards, Vizzavona; *G. hypocrita*, Serv., Ajaccio; *G. stercorarius*, Linn., Vizzavona. *Oryctes grypus*, Ill., Ajaccio, one ♂. *Pachypus cornutus*, Oliv., one ♂, flying in the town of Ajaccio, towards evening. *Rhizotrogus bellieri*, Reiche, four specimens, found by Colonel Yerbury in July, Vizzavona. *Polyphylla fullo*, L., Vizzavona. *Anomala junii*, Duftschm., Ajaccio. *Cetonia aurata*, L., very abundant on flowers at Tattone, Vizzavona, Vivario, Corte, etc., and exceedingly variable, green, blue, coppery, or black, often green with the thorax and scutellum coppery; *C. floricola*, Herbst, rarely, in company with the preceding; *C. opaca*, Gory, and *C. morio*, F., Ajaccio, the latter very abundant on thistle flowers, and difficult to extract therefrom, also at Corte, etc.; *C. hirtella*, L., and *C. stictica*, L., Vivario, Vizzavona, Corte, etc. *Trichius gallicus*, Heer (*abdominalis*, Dej.), Ajaccio, and *T. zonatus*, Germ., rarely, Bocognano and Vizzavona.

Chalcophora mariana, Lap., a few specimens on the trunks of pines, Vizzavona; subsequently found by Colonel Yerbury in some numbers with various other Buprestidæ at a new saw-mill at Tattone. *Capnodis tenebricosa*, Herbst, not uncommonly on the coast at Ajaccio, flying about in the hot sun. *Ancylochira rustica*, L., *A. flavomaculata*, F., *and A. octoguttata*, L., at the saw mill, Tattone, Colonel Yerbury. *Melanophila appendiculata*, F., and *Phœnops cyanea*, F., rarely, pine forests, Vizzavona. *Anthaxia inculta*, Germ., and *A. grammica*, Lap., not rarely, on flowers, Ajaccio; *A. millefolii*, F., Ajaccio. *Ptosima 9-maculata*, F., on bushes, Ajaccio. *Acmæodera adspersula*, Ill., not uncommonly, *A. tæniata*, F., rarely, on flowers, Ajaccio. *Sphenoptera lineata*, F., Ajaccio. *Chrysobothrys affinis*, F., saw-mill, Tattone, Colonel Yerbury. *Corœbus rubi*, L., on bramble bushes, Ajaccio and Corte. *Agrilus viridis*, L., Vizzavona; *A. roscidus*, Kies., Ajaccio; *A. solieri*, Gory (?), Corte and Ajaccio. *Trachys pygmæa*, F., on flowers, Ajaccio. *Throscus carinifrons*, De Bonv., not rarely, by sweeping bracken towards evening, in the pine forests, Vizzavona; *T. corsicus*, Reitt.,* three examples by sweeping, Bocognano and Vizzavona. *Melasis buprestoides*, L., in dead beech, Vizzavona. *Adelocera carbonaria*, Schrank, commonly,

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under bark of dead pines, especially where charred by fire, Vizzavona. *Elater præustus*, F., commonly, under bark of pines, Vizzavona, varying greatly in the amount of black at the apex of the elytra; *E. pomonæ*, Steph., four specimens, with the preceding, inseparable from others from England (from the New Forest). *Cryptohypnus meridionalis*, Lap., rarely (and very difficult to secure), on the banks of the Tavignano, Corte. *Cardiophorus ulcerosus*, Gené, and *C. eleonoræ*, Gené, commonly, by sweeping, Bocognano. *Athous rhombeus*, Oliv., one specimen, Vizzavona; *A. depressifrons*, Desbr. (?),* a few examples, by sweeping, Corte and Vizzavona; *A. corsicus*, Desbr. (?), one specimen, Corte.

Helodes genei, Guér., damp places, Corte, Vizzavona, Bocognano. *Hydrocyphon deflexicollis*, Müll., Corte. *Cyphon*, sp. (?), Vizzavona. *Dictyoptera sanguinea*, Scop., pine forest, Vizzavona, rarely. *Telephorus præcox*, Gené,* not uncommon, on flowers of foxglove, forest of Vizzavona. *Rhagonycha corsica*, Reiche, on flowers of Umbelliferæ, etc., Vizzavona, Bocognano, Vivario, Corte. *Malthodes*, 3 spp. (?), Vizzavona. *Troglops silo*, Er., three specimens, on the coast at Ajaccio. *Charopus concolor*, F., by sweeping, Bocognano. *Colotes maculatus*, Lap., on flowers, Corte and Ajaccio; *C. punctatus*, Er., rarely, on the sandy beach at Ajaccio. *Sphinginus apicalis*, Perr., a few specimens on flowers, Vizzavona. *Attalus* (*Antholinus*) *sericans*, Er., and sp. (?), Corte and Bocognano. *Malachius rufus*, Oliv., Corte; *M. sardous*, Er., Bocognano; *M. bipustulatus*, L., Vizzavona and Corte; *M.* (*Oogynes*) *longicollis*, Er., commonly, on the flowers of low plants on the mountains, between 2,000–5,000 feet, Bocognano and Vizzavona; *M. cyanipennis*, Er., Corte. *Dasytes tibialis*, Muls., rarely, in flowers, pine forest, Vizzavona; *D. fusculus*, Ill., and *D. plumbeus*, Müll., commonly, Vizzavona, Ajaccio, etc.; *D. pilicornis*, Kies. (?), one specimen, Bocognano. *Dolichosoma nobile*, Kies., common, on the coast at Ajaccio. *Haplocnemus impressus*, Marsh., on flowers, Bocognano and Vizzavona; *H. xanthopus*, Kies.,* Vizzavona; *H. cribricollis*, Muls.* (?), Corte and Ajaccio. *Danacæa picicornis*, Küst., and sp. (?), commonly, on flowers, Vivario, Vizzavona, Bocognano and Ajaccio. *Clerus formicarius*, L., abundant on cut pines, Vizza-

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vona; *C. 4-maculatus*, Schall., one specimen, on a fallen pine, Vizzavona. *Trichodes alvearius*, F., Vivario and Vizzavona. *Plinus fur*, L., in the Hôtel Dependance at Vizzavona; *P. dubius*, Sturm, Vizzavona; *P. lichenum*, Marsh., Vivario and Corte. *Dryophilus densipilis*, Ab., four specimens, by sweeping, Corte. *Ernobius parens*, Muls., and *Ernobius*, sp. (?), by beating dead pine tops, Vizzavona. *Xestobium rufovillosum*, Deg., Vizzavona. *Xyletinus laticollis*, Duftschm., rarely, by sweeping, Bocognano. *Metholcus cylindricus*, Germ., Ajaccio. *Lasioderma bubalus*, Fairm., Corte.

Bostrychus capucinus, L., fortuitously, Vivario and Vizzavona. *Cis boleti*, L., *C. setiger*, Mell., *C. hispidus*, Gyll., and *C.* sp. (?), Vizzavona.

Pachychila servillei, Sol., and *Tentyria ramburi*, Sol., on the sandy shores of the Bay of Ajaccio. *Akis punctata*, Thunb., on the roads, not rarely, near Corte. *Asida carinata*, Sol., abundant on the Col between Vizzavona and Ghisoni, at about 6,000 feet, under stones, also occasionally on the lower slopes, and on the roads about La Foce; *A. corsica*, Lap., two specimens, on the coast at Ajaccio. *Pimelia sardoa*, Sol., crawling about everywhere along the shore of the Bay of Ajaccio. *Crypticus gibbulus*, Quens., common, under stones, Ajaccio. *Dendarus tristis*, Rossi, Ajaccio, Vivario, and Vizzavona. *Pedinus meridianus*, Muls., Ajaccio and Corte. *Colpotus godarti*, Muls. (one ♂), Ajaccio, under stones. *Opatrum pusillum*, F., and *O. rusticum*, Ol., Ajaccio. *Ammophthorus rufus*, Luc., abundantly, *Phalaria oblonga*, Küst., commonly, and *P. cadaverina*, F., rarely, along the shores of the Bay of Ajaccio. *Diaperis boleti*, L., one specimen, in fungus on beech, Vizzavona. *Corticeus castaneus*, F., and *C. pini*, Panz. (?), under bark of pines, common, forest of Vizzavona; *C. bicolor*, Oliv., under bark of beech, Vizzavona. *Uloma culinaris*, Linn., rarely, and *U. perroudi*, Muls., and *Menephilus cursipes*, F., more or less commonly, under the bark of pines, Vizzavona. *Helops superbus*, Muls., one of the finest species of the genus, and apparently confined to the mountain-forests of Corsica, and *H. cæruleus*, L., both common, beneath the loose bark of pine stumps, or of dead standing pines, Vizzavona; *H. genei*, Allard, four specimens, beaten from branches of a fallen pine, Vizzavona. *Isomira corsica*, Muls., Bocognano; *I.*

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murina, L., Vizzavona. *Omophlus lepturoides*, F., Ajaccio and Corte; *O. picipes*, F., Ajaccio and Vizzavona. *Lagria hirta*, L., Vizzavona. *Orchesia undulata*, Kr., in fungus on beech, Vizzavona. *Xylita revelierei*, Muls., four examples, in the crevices of the bark of a fallen pine, Vizzavona. *Melandrya caraboides*, L., not uncommon, under bark of beech, etc., these specimens have the elytra bluer in colour than those from England. *Salpingus nitidus*, Chevr. (= *reyi*, or *exsanguis*, Abeille), four specimens, by beating dead pine branches, Vizzavona; originally recorded from Algeria. *Rhinosimus planirostris*, Vizzavona. *Notoxus cornutus*, F., Bocognano. *Anthicus longicollis*, Schmidt, on the sandy banks of streams, beneath stones, Corte and Bocognano; *A. fenestratus*, Schmidt, Corte; *A. corsicus*, Lap., swarming on bushes (including olive) on the hill-sides near Ajaccio, also at Bocognano. *Mordella aculeata*, L., *M. fasciata*, Fabr., and *M. bipunctata*, Germ., Ajaccio and Corte. *Mordellistena pumila*, Gyll., Ajaccio. *Anaspis thoracica*, L., *A. pulicaria*, Costa, and *A.* spp., Vizzavona, Vivario, etc. *Silaria suturalis*, Em., Corte, Vivario, Bocognano, and Vizzavona. *Meloe brevicollis*, Panz., two specimens, on the mountain slopes above Vizzavona, at about 4,500 feet elevation. *Zonitis mutica*, Scriba, abundant, on thistle-heads, Corte. *Œdemera podagrariæ*, L., *O. barbara*, F., *O. flavipes*, F., *O. nobilis*, Scop., and *O. lurida*, Marsh., Ajaccio, Bocognano, Corte, etc. *Stenostoma rostratum*, F., on the beach, Ajaccio.

Otiorrhynchus guttula,* Fairm., swarming on the catkins of the alder, on the summit of the Col between Vizzavona and Ghisoni, occasionally found lower down; *O. intrusus*,* Reiche, Bocognano; *O. corsicus*,* Fairm., a few specimens under stones, in the same locality as *O. guttula*. *Peritelus parvulus*,* Seidl., one specimen, Vizzavona; *P.* (*Meira*) *latiscrobs*,* Desbr., two specimens, by sweeping bracken in the pine-forest of Vizzavona. *Phyllobius pellitus*, Boh., swarming on alders, Vizzavona. *Metallites parallelus*,* Chevr., commonly, by beating arborescent heath, pines, and other trees, Bocognano, Vizzavona, etc. *Polydrusus leucaspis*, Boh., Corte. *Strophosomus coryli*, F., Vizzavona. *Caulostrophus delarouzei*, Fairm., by beating various trees, Bocognano and Vizzavona. *Brachyderes analis*, Desbr.,* in plenty on pines at the upper limit of their growth on the mountain slopes above Vizzavona. *Thylacites fritillum*,

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Panz., Ajaccio, and *T. lapidarius*, Gyll., Bocognano and Vizzavona, under stones. *Cleonus* (*Plagiographus*) *tabidus*, Oliv. (*pelleti*, Fairm.), one specimen, beaten from arborescent heath, Bocognano. *Lixus scolopax*, Boh., not rare, Ajaccio and Bocognano; *L. cribricollis*, Boh., Vizzavona. *Larinus latus*, Herbst, on thistles, Corte; *L. genei*, Boh., Corte, Bocognano, and Ajaccio; *L. turbinatus*, Gyll., Corte. *Hypera pedestris*, Payk., Bocognano; *H. trilineata*, Marsh., Corte. *Pissodes notatus*, F., commonly on pines, Vizzavona. *Smicronyx corsicus*,* Fairm., not uncommonly, by beating arborescent heath, Bocognano and Tattone. *Anoplus roboris*, Suffr., Vizzavona. *Brachytemnus porcatus*, Germ., common, under pine-bark, Vizzavona. *Acalles setulipennis*,* Desbr., and *A. henoni*, Bedel, Vizzavona; the latter hitherto only known from Algeria. *Cœliodes exiguus*, Oliv., Ajaccio. *Ceuthorrhynchus echii*, F., Ajaccio and Bocognano; *C. duvali*, Bris., one specimen, beaten from alder-catkins, on the summit of the Col between Vizzavona and Ghisoni; *C. smaragdinus*, Bris., Corte; *C. cyanipennis*, Germ., Corte and Ajaccio. *Ceuthorrhynchidius troglodytes*, F., Bocognano. *Baris insularis*, Desbr.,* one specimen, Ajaccio; *B. cærulescens*, Scop., Corte. *Balaninus elephas*, Gyll., Vizzavona; *B. turbatus*, Gyll., and *B. glandium*, Marsh., Bocognano. *Sibinia arenariæ*, Steph., Ajaccio; *S. attalica*, Gyll., not uncommonly, Bocognano. *Miccotrogus suturatus*, Perris (?),* one specimen, Bocognano. *Orchestes erythropus*, Germ., var. *tricolor*, Kies., and *O. fagi*, L., Vizzavona. *Mecinus circulatus*, Marsh., Bocognano; *M. pyraster*, Herbst, Corte. *Gymnetron pascuorum*, Gyll., Bocognano; *G. tetrum*, F., on Verbascum, Vizzavona; *G. lanigerum*, Bris. (?), Bocognano. *Miarus campanulæ*, L., Vizzavona. *Cionus hortulanus*, Marsh., Ajaccio, Bocognano, Corte. *Nanophyes niger*, Waltl, Bocognano and Vizzavona; *N. nitidulus*, Gyll., Bocognano. *Apion flavofemoratum*, Herbst, *A. viciæ*, Payk., Ajaccio; *A. frumentarium*, L., *A. æneum*, F., *A. malvæ*, F., *A. lævicolle*, Kirby, *A. brevirostre*, Herbst, and other species, Corte; *A. nigritarse*, Kirby, and *A. violaceum*, Kirby, Vizzavona; *A. tubiferum*, Gyll., and *A. subparallelum*, Desbr. (?), Bocognano. *Attelabus curculionoides*, L., Bocognano, Vizzavona, Corte. *Platyrrhinus latirostris*, F., not uncommon in fungus on old decaying beech-trees, forest of Vizzavona. *Scolytus rugulosus*, Ratz.,

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Ajaccio. *Myelophilus minor*, Hart., in pine-bark, Vizzavona; these specimens are unusually large, and have strongly tuberculate elytra. *Hylastes ater*, Payk., and *H. attenuatus*, Er., on the pines, Vizzavona. *Cryphalus numidicus*, Eichh., *Tomicus sexdentatus*, Boern., *T. suturalis*, Gyll., *T. longicollis*, Gyll., and *T. proximus*, Eichh., *Pityophthorus glabratus*, Eichh., and *Pityogenes bistridentatus*, Eichh. (?), in or under bark of *Pinus laricio*, Vizzavona. *Crypturgus cinereus*, Herbst, in the small branches of the same trees, Vizzavona. *Xyleborus saxeseni*, Ratz., rarely, and *Taphrorychus bicolor*, Herbst, commonly, on beech-logs, Vizzavona.

Bruchus longicornis, Germ., common, Ajaccio and Vivario; *B. atomarius*, L. (?), Corte; *B. dispar*, Germ., Bocognano; and various other species of the genus. *Spermophagus cardui*, Boh., Corte.

Spondylis buprestoides, L., saw-mill at Tattone, Colonel Yerbury, three examples. *Ergates faber*, L., fragments of dead specimens only, in the rotten pine-trees at Vizzavona, in June; one male bred from a pupa after return to England; female subsequently obtained in numbers at Tattone by Colonel Yerbury; the enormous ♂ larvæ sometimes found under bark of dead standing pines. *Leptura rubra*, L., *L. fulva*, Deg., *L. scutellata*, F., and *L. hastata*, Sulz., Vizzavona. *Strangalia aurulenta*, F., *S. maculata*, Poda, Vizzavona; *S. bifasciata*, Müll., Corte and Ajaccio. *Stenopterus rufus*, L., Vizzavona, and *S. ater*, L., Vivario, Corte, and Ajaccio, on Umbelliferous flowers. *Cerambyx scopolii*, Fuessly, *Criocephalus rusticus*, L., *Hylotrupes bajulus*, L., Vizzavona and Tattone, also found by Colonel Yerbury. *Clytus arietis*, L., and *C. rhamni*, Germ., Vizzavona and Corte. *Xylotrechus arvicola*, Oliv., Vizzavona. *Clytanthus massiliensis*, L., common on flowers, Ajaccio, Bocognano, Vivario, Corte. *Morimus lugubris*, F., common, in the beech-forest at Vizzavona, about logs, etc. *Acanthocinus griseus*, F., about twenty specimens, on a fallen pine, Vizzavona. *Pogonochærus perroudi*, Muls., a few specimens, in company with the preceding, in the pine-forest at Vizzavona. *Anæsthetis testacea*, L., one specimen, Vizzavona. *Agapanthia cardui*, L., Vizzavona. *Phytœcia virescens*, F., Ajaccio, Bocognano, and Corte; *P. ephippium*, F., Ajaccio.

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Labidostomis taxicornis, F., and *L. centromaculata*, Gené, not uncommon, Ajaccio, Bocognano, and Corte. *Lachnæa sexpunctata*, Scop., abundant, on bushes, in the hot sun, Ajaccio, Bocognano, Vizzavona, Corte, etc. *Clythra læviuscula*, Ratz., Corte. *Titubœa biguttata*, Oliv., var. *dispar*, Luc., Corte. *Coptocephala scopolina*, L., common, flying in the hottest sun, Ajaccio. *Cryptocephalus pygmæus*, F., Ajaccio, Bocognano, and Vizzavona; *C. morœi*, L., and *C. ocellatus*, Drap., Vizzavona, rarely. *Pachybrachys scriptus*, H.-S., and *Stylosomus depilis*, Ab. (nec *minutissimus*, Germ.), not uncommon, by beating arborescent heath, etc., Bocognano. *Colaspidea oblonga*, Blanch., Ajaccio. *Chrysomela banksi*, F., and *C. hæmoptera*, L., Ajaccio; *C. quadrigemina*, Suffr., Bocognano. *Lina populi*, L., Vivario. *Prasocuris* (*Hydrothassa*) *pumila*, Reiche, Vizzavona. *Luperus flavipes*, L., Vizzavona. *Galeruca corsica*, Joann.,* Vizzavona. *Galerucella luteola*, Müll., Corte. *Podagrica intermedia*, Kutsch., Corte. *Crepidodera rubicunda*,* Perris, Corte. *Haltica* sp., *Longitarsus* spp., Bocognano. *Psylliodes* sp., Corte.

Hispa atra, L., Bocognano. *Cassida equestris*, F., Vizzavona; *C. hemisphærica*, Herbst, Bocognano.

Epilachna chrysomelina, F., Ajaccio. *Coccinella oblongoguttata*, L., and *C.* 18 *guttata*, L., on the pines, Vizzavona; *C.* 11-*notata*, Schneid., Bocognano and Corte; *C. revelieri*, Muls., Corte; *C. conglobata*, L., Vizzavona; *C.* 7-*punctata*, L., *C.* 22-*punctata*, L., Ajaccio, etc.; *C. bipunctata*, L., *C. variabilis*, Ill., and *C.* 14-*punctata*, L., Vizzavona, etc. *Chilocorus bipustulatus*, L., Ajaccio. *Exochomus* 4-*pustulatus*, L., Vizzavona, Bocognano, etc. *Platynaspis villosa*, Fourcr., Bocognano. *Scymnus fasciatus*, Fourcr., *S. damryi*, Weise,* and spp., Bocognano, Vizzavona, etc.

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VIII. *A list of the Hemiptera-Heteroptera collected by* Mr. Champion *in Corsica in June*, 1893, *with a description of one new species.* By Edward Saunders, F.L.S.

[Read Feb. 28th, 1894.]

Odontoscelis fuliginosa, Linn., Ajaccio.
Odontotarsus grammicus, Linn., Vivario and Vizzavona. (2500—4000 ft.)
Eurygaster maura, Linn., Vizzavona.
Ancyrosoma albolineatum, Fab., Ajaccio, Vizzavona.
Graphrosoma lineatum, Linn., Ajaccio, Vizzavona.
Brachypelta aterrima, Foerst., Corte.
Sciocoris sulcatus, Fieb., Corte, Bocognano.
Dryoderes marginatus, Fab., Corte.
Ælia acuminata, Linn., Vizzavona, Vivario.
Peribalus vernalis, Wolff, Corte.
Carpocoris fuscispinus, Boh., Vizzavona, Ajaccio.
Palomena viridissima, Pod., Vizzavona.
Pentatoma juniperina, Linn., Bocognano.
Piezodorus incarnatus, Germ., Bocognano and Vizzavona.
Rhaphigaster grisea, Fab., Ajaccio.
Eurydema ornatum, L., Corte.
„ *decoratum*, H.-S., Corte, Vizzavona, Ajaccio.
„ *pictum*, H.-S., Ajaccio.
„ *oleraceum*, Linn., Vizzavona.
Elasmostethus interstinctus, Linn., Vizzavona.
Spathocera lobata, H.-S., Bocognano, Vizzavona.
Centrocoris spiniger, Fab., Bocognano, Vizzavona.
Syromastes marginatus, Linn., Corte, Vizzavona.
Verlusia rhombea, Linn., Ajaccio, Bocognano, Vizzavona.
„ *sulcicornis*, Fab., Bocognano.
Gonocerus insidiator, Fab., Bocognano.
Ceraleptus squalidus, Costa, Vizzavona.
Loxocnemis dentator, Fab., Vivario.
Coreus affinis, H.-S., Bocognano, Corte, Vizzavona.
„ *denticulatus*, Scop., Corte, Vizzavona.
Strobilotoma typhæcornis, Fab., Corte and Vizzavona.

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Camptopus lateralis, Germ., Vizzavona, Ajaccio.
Therapha hyoscyami, Linn., Bocognano, Vizzavona.
Corizus crassicornis, Linn., „ „ Vivario.
„ *capitatus*, Fab., Vizzavona.
„ *parumpunctatus*, Schil., Vizzavona and Bocognano.

Megalomerium meridionale, Costa, Ajaccio.
Lyæus militaris, Fab., Ajaccio, Corte, Bocognano, Vizzavona.
„ *equestris*, Linn., Vizzavona.
„ *saxatilis*, Scop., „
„ *apuanus*, Rossi, „
Lygæosoma reticulatum, H.-S., Vizzavona, Vivario.

Nysius thymi, Wolff, Bocognano.

Cymus melanocephalus, Fieb., Ajaccio, Vizzavona.

Ischnorhynchus geminatus, Fieb., Vizzavona.

Geocoris lineola, Ramb., Ajaccio.

Heterogaster affinis, H.-S., Vizzavona.

Microplax interrupta, Fieb., Vizzavona.
„ *albofasciata*, Costa, „

Metopoplax ditomoides, Costa, Vizzavona.
Macroplax fasciata, H.-S., Bocognano, Ajaccio, Vizzavona, Vivario.

Rhyparochromus prætextatus, H.-S., Vizzavona.

Stygnus pedestris, Fall., Corte.

Peritrechus geniculatus, Hahn, Vizzavona.

Trapezonotus agrestis, Fall., Vizzavona, Vivario.

Calyptonotus rolandri, Linn., Ajaccio.
Aphanus inarimensis, Costa, Bocognano, Vizzavona.
„ *douglasi*, Fieb., Vizzavona.*

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Beosus erythropterus, Brullé, Vizzavona, Corte.
„ *luscus*, Fab., Corte.

Eremocoris fraternus, Horv. (?), Vizzavona.
Scolopostethus cognatus, Fieb., Vizzavona and Bocognano.
Gastrodes ferrugineus, Linn., Vizzavona.
Pyrrhocoris apterus, Linn., Ajaccio.
Serenthia læta, Fall., Vizzavona.

Monanthia cardui, Linn., Ajaccio, Corte, Vizzavona.
„ „ var. *cognata*, Fieb., Vivario.*
„ *auriculata*, Costa, var. (?), Vizzavona, Corte.
„ *angustata*, H.-S., Bocognano.
„ *wolffii*, Fieb., Bocognano, Ajaccio, Corte.
„ *nassata*, Put., Ajaccio.

Aradus cinnamomeus, Panz., Vizzavona, Bocognano.
„ *krueperi*, Reut., Vizzavona.
„ *varius*, Fab., Vizzavona.
„ *depressus*, Fab., Vizzavona.

Gerris najas, De Geer, Vizzavona.
„ *thoracica*, Schum., Vizzavona.
„ *gibbifera*, Schum., Corte.

Harpactor erythropus, Linn., Ajaccio, Corte, Vivario, Vizzavona.
„ *iracundus*, Poda, Corte.

Coranus ægyptius, F., Ajaccio.

Nabis lativentris, Boh., Corte, Vizzavona.
„ *rugosus*, Linn., Vizzavona.
„ *ferus*, Linn., Vizzavona.

Salda cocksii, Curt., var. *geminata*, Corte.

Piezostethus obliquus, Cost., Ajaccio.
Scoloposcelis angusta, Reut., Vizzavona.
Elatophilus nigricornis, Zett., „
Anthocoris confusus, Reut., „
Triphleps nigra, Wolff, Ajaccio.
„ *horvathi*, Reut. (?), Corte.

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Miris lævigatus, Linn., Vizzavona.

Lopus lineolatus, Brullé, Vizzavona.
„ *mat*, Rossi, Vizzavona.

Phytocoris femoralis, Fieb., Bocognano.

Calocoris vandalicus, Rossi, Corte.
„ *sexpunctatus*, Fab., Ajaccio, Vizzavona, Corte.
„ *bipunctatus*, Fab., Bocognano, Vizzavona, Corte.
„ *trivialis*, Cost., Bocognano.
„ *ventralis*, Reut., Corte.
Lygus pratensis, Fab., Vizzavona.
„ *pastinacæ*, Fall., Vizzavona, Ajaccio.
„ *cervinus*, H.-S., „
Pœciloscytus gyllenhali, Fall., Corte.
Camptobrochis punctulata, Fall., Vizzavona, Bocognano.
Capsus laniarius, Linn., Corte.
Pilophorus cinnamopterus, Kb., Bocognano, Ajaccio.

Strongylocoris obscurus, Ramb., Bocognano.

Orthocephalus championi, Saund.*
(See description at the end of the list.)

Dicyphus hyalinipennis, Klug, Ajaccio.
„ *geniculatus*, Fieb., Bocognano.

Globiceps sphegiformis, Rossi, Corte.

Heterotoma diversipes, Put., Corte, Ajaccio.

Placochilus seladonicus, Fall., Ajaccio.
Pachyxyphus lineellus, M. & R., Corte, Vizzavona.

Macrotylus longirostris, Fieb., Bocognano.

Psallus mollis, M. & R., Vizzavona, Bocognano.
„ *anchorifer*, Fieb., Bocognano, Ajaccio.

Criocoris crassicornis, Hahn, Corte.

Corixa semistriata, Fieb., Vizzavona.

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Orthocephalus championi, sp. n.

Piceo-niger nitidiusculus, lævis, pilis nigris, pilisque squamiformibus albis, facillime divellendis, vestitus ; capite transverso, oculis rotundatis, prominulis, vertice inter eos quam oculo (♂) fere duplo, (♀) duplo et dimidio latiore, postice acute carinato, antennis piloculis, articulis primo et secundo incrassatis, testaceis, hoc versus apicem piceo nigro, duobus sequentibus simul sumptis longiore, maris lateribus subparallelis, feminæ fusiforme ; tertio quartoque filiformibus, tertio basi testaceo, quarto duplo longiore ; prothorace lævi, trapezoidale, planiusculo, angulis anticis rotundatis, lateribus rectis, callis discretis ; scutello lævi ; hemielytris (♂) corio interne plus minus late pallido-testaceo, membrana infumata, venis nigropiceis, basi areolisque pallidis, (♀ brach.) abdomine brevioribus, apicibus oblique truncatis, corio margine interno basi arcte pallido ; pedibus testaceis, femoribus piceo nebulosis, tibiis nigro punctatis, setis spiniformibus ornatis ; subtus nigropilosus et albo squamiger. Long.: ♂ 4½ mm., ♀ 4 mm.

Hab. Bocognano, Corsica, on aromatic plants.

This is a beautiful addition to the European fauna, which I have pleasure in naming after its discoverer. I have sent examples of it to Dr. Reuter, who has kindly examined them, and agrees in considering them as belonging to an undescribed species allied to *bivittatus*, Fieb., though at once distinguishable by the form, etc., of the antennæ.

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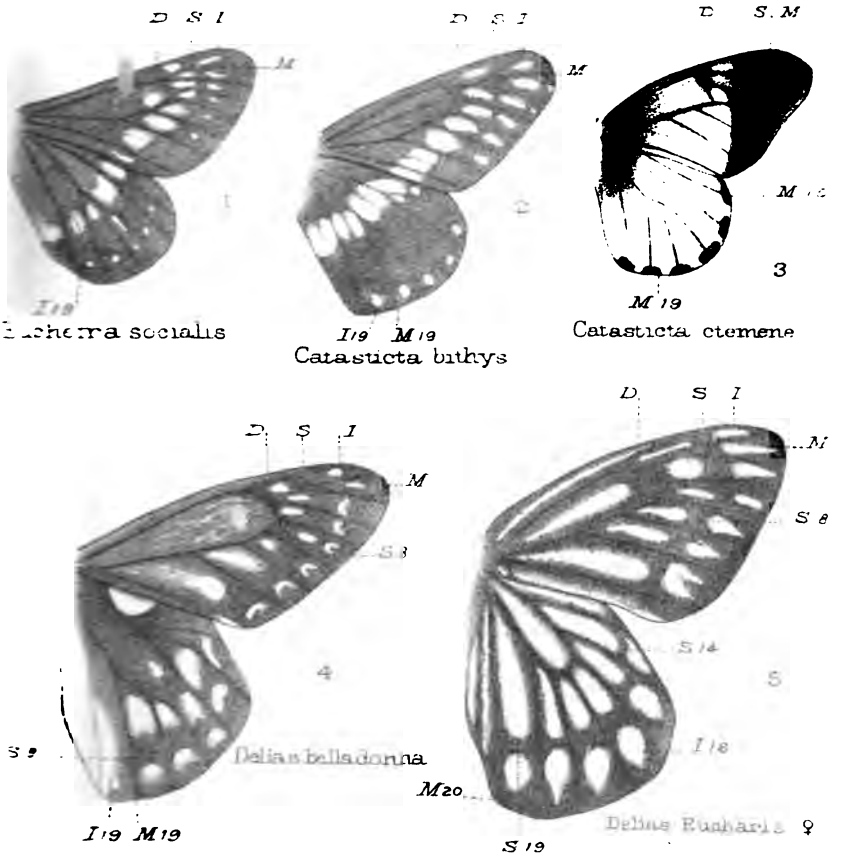

West, Newman imp.

Wings of Pierinæ.

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IX. *On the Phylogeny of the* Pierinæ, *as illustrated by their Wing-markings and Geographical Distribution.*

By Frederick A. Dixey, M.A., M.D., F.E.S., Fellow of Wadham College, Oxford.

[Read February 7th, 1894.]

Plates III., IV., V.

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I. Introductory.

In the present paper my object has been to apply to the study of the subfamily *Pierinæ* the methods which I used in investigating the phylogenetic relations of another group of Lepidoptera, as recorded in a former communication to this Society.* I have in the first place endeavoured to work out the homology of the various

* "On the Phylogenetic Significance of the Wing-markings in certain genera of the Nymphalidæ," Trans. Ent. Soc. Lond., 1890.

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markings to be found throughout the group, and have then attempted to state the phylogenetic conclusions to which this evidence appears to lead. Though my principal aim has been the elucidation of the Pierine wing-markings, which so far as I am aware have never before been systematically studied from this point of view, I have not ignored those other features that are usually known as "structural"; and I have also tried to estimate the bearing upon phylogenetic questions of the facts relating to the present distribution of the *Pierinæ* in space. The serious limitations under which anyone who wishes to construct a phylogeny for such a group as this must necessarily labour have been elsewhere acknowledged; it is of course manifest that little or no help can be expected from embryological or palæontological sources. There are, however, many compensating features to be reckoned on the other side; and in view of certain comments that have at times been passed on previous work of this kind, I may perhaps be allowed to quote a few sentences from the writings of one of our leading naturalists, which seem to me to state the special advantages afforded by these and similar researches with a force and cogency that it would not be easy to gainsay. After pointing out the pre-eminent value of the Diurnal Lepidoptera to the student of distribution and variation, the writer I refer to proceeds as follows—"But besides their abundance, their universal distribution, and the great attention that has been paid to them, these insects have other qualities that especially adapt them to elucidate the branches of inquiry already alluded to. These are the immense development and peculiar structure of the wings, which not only vary in form more than those of any other insects, but offer on both surfaces an endless variety of pattern, colouring, and texture. . . . This delicately painted surface acts as a register of the minutest differences of organization,—a shade of colour, an additional streak or spot, a slight modification of outline continually recurring with the greatest regularity and fixity, while the body and all its other members exhibit no appreciable change. The wings of butterflies, as Mr. Bates has well put it,* 'serve as a tablet on which Nature writes the

* See "The Naturalist on the Amazons," 2nd edit., p. 412.

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story of the modifications of species'; they enable us to perceive changes that would otherwise be uncertain and difficult of observation, and exhibit to us on an enlarged scale the effects of the climatal and other physical conditions which influence more or less profoundly the organization of every living thing."* Whether any particular investigator is or is not competent to undertake this kind of research may be open to question, but I think that the study itself needs no further vindication than these words of Mr. Wallace.

In treating of the details of the wing-markings I have tried to be intelligible and explicit, even at the cost of being somewhat lengthy. I have, however, been obliged to content myself with selected examples; a complete treatment would run to a vast length, and in most cases the lines here laid down may be easily applied to the insects not mentioned in this paper. Some of the identifications of markings may at first sight seem startling; for instance, that of the straight orange-coloured line crossing the disc of the wings in *Dercas* with the series of black spots in the females of *Ganoris*; but I believe that in every such case it will be found that the homology can be certainly traced, step by step. It is hardly necessary to point out the importance of being on one's guard against the misleading suggestions of merely superficial resemblances, and also of giving due weight to the disturbing influence of mimicry. The details of this latter process, when minutely examined in a favourable group such as the *Pierinæ*, are seen to be of so complicated and interesting a character, that I may hope to be excused for having treated of some of these details with considerable fulness, and even for having ventured to introduce a new term in order to distinguish a special case of the phenomenon known as "Convergence."†

The generic names employed in this paper are those of Mr. Butler in his well-known "Revision" (Cistula Entomologica, vol. i., 1870, p. 33), supplemented by subsequent memoirs from the hand of the same author, and

* "On the Papilionidæ of the Malayan Region," Trans. Linn. Soc., xxv., p. 1 (1866).

† See page 298.

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by the arrangement at present adopted in the National Collection under his charge. I confess that I am not always in agreement with this arrangement, but the importance of a definite and accessible standard is obvious, and no better one could be found for my purpose. Even if the genera are not in every instance distinguished by characters of real "generic value," they are usually natural groups, and in most cases of great convenience in practice. The list of genera and species which I have appended may be found useful as indicating the exact insects which are mentioned in the course of the paper, and also as giving an idea of the scope and contents of those genera whose names may still be somewhat unfamiliar. A paper of this kind is not the place in which to introduce changes of nomenclature or to discuss questions of synonymy; and as regards classification I have done no more than throw out a few suggestions which, perhaps, may one day be taken up.

II. The Wing-markings.

1. *The submarginal series of dark spots.*

Comparing together the three species of the subfamily *Pierinæ* that are commonest in this country, viz., *Ganoris brassicæ*, *G. rapæ*, and *G. napi*, we find that the females of all three resemble one another in the possession of a series of black spots on the upper surface of the forewing. One of these spots (Fig. 16, S 8) occurs between the second and third median nervules; another (ibid., S 10), between the first median nervule and the submedian nervure; and the third (ibid., S 11) between the submedian nervure and the inner margin of the wing. The latter spot, which varies considerably in the amount of its development, takes the form of a streak nearly parallel with the inner margin. In the males, this series of spots is evanescent. The whole series is normally absent in *G. brassicæ* ♂, and in some specimens of *G. rapæ* ♂, and *G. napi* ♂; the males of the two latter species, however, generally have the spot between the second and third median nervule more or less developed, though the other two are not present. Turning to the underside of the wing in these species, we find the first two spots usually present in both males and females;

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the third is but faintly visible in the female, and in the male not visible at all. These three spots are all that can be seen in ordinary specimens of *G. brassicæ, rapæ,* and *napi;* but in some specimens of *G. napi,* and less distinctly in some of *G. rapæ,* the series is continued towards the anterior border of the wing by a fourth spot placed just behind the junction of the third and fourth subcostal nervules, and traversed by the first discoidal. The spots that have now been referred to can be seen in a very well-marked form in *G. gliciria.*

These indications of a submarginal series of black markings become more pronounced in *Synchloe daplidice.* Here, in the female, a submarginal row exists in easily recognisable form, three of the constituent spots of which are clearly homologous with those already described in *G. napi, rapæ,* and *brassicæ* (Fig. 15). In this region of the wing nearly every interspace between nervules contains a spot; the spots tending to become confluent, especially towards the costal margin. There is generally no spot between the first and second median nervules, and often none between the submedian nervure and the inner margin of the wing. In the male, the anterior portion of the series is distinct enough, the large spot, however, between the submedian nervure and first median nervule is absent from the upper surface, though regularly present beneath. The female *S. daplidice* also shows a continuation of the same series on the hindwing, well-marked at the costa, but usually becoming less plain as the anal angle is approached. In the male *S. daplidice,* one term of the series is generally all that is present in the hindwing; and turning back to *G. brassicæ, rapæ,* and *napi,* we find the same spot invariably present on the upper, and often on the lower surface of the costa in the hindwing of both sexes (Figs. 15, 16, S 14—18).

Other species of the genus *Synchloe* present the same submarginal series in greater completeness. *S. callidice* ♀, for instance, has the whole series well developed on the forewing, and in most specimens on the hindwing also. A comparison with *S. daplidice* will show that the series is really homologous in the two cases, and will, moreover, demonstrate that in *S. callidice* the smallest spot of the series belongs to the interspace between the first and second median nervules, which in *S. daplidice* is usually

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not furnished with a spot at all; and that the largest and best-marked member of the group, namely that between the second and third median nervules, corresponds with the spot which we saw to be most persistent in the males of *G. brassicæ*, *rapæ*, and *napi*. This spot, moreover, as well as the next most persistent (that between the first median and submedian), is usually picked out with black on the underside of both *S. callidice* and *S. daplidice*, where the markings corresponding to those of the upper surface are, as a rule, chiefly composed of green or yellow scales with but small admixture of black. The hindwing of *S. callidice* ♀ shows a continuation of the series; though here the markings as they approach the inner margin tend to assume the appearance of chevrons rather than of spots, which tendency is still more marked on the underside.

The South American genus *Tatochila* presents the same series on both fore and hindwings, the females as a rule most completely (as in *T. autodice*). The male of *T. theodice*, however, exhibits the whole series quite plainly; and in both of these species the markings in question tend to assume the form of a line of chevrons, the apices of which point towards the margin of the wing, instead of towards the base, as in *S. callidice*.

I propose to distinguish this series of spots as S (for Submarginal), numbering the constituent markings according to the interspaces they respectively occupy. In all the forms as yet mentioned the full number of marginal interspaces, from the costal nervure to the anal angle, is in the forewing 11, in the hindwing 8. Another space may be reckoned in the hindwing, that, namely, between the costal margin and the costal nervure. The corresponding space in the forewing is exceedingly narrow, and never carries a separate spot. We may take then the number of spaces potentially containing spots as 11 and 9 in the fore and hindwing respectively, and may designate all possible terms of the series as S 1—20, beginning at the costa of the forewing. None of the species above referred to exhibits the whole range of spots from 1 to 20 in a discrete condition, some being generally absent and others fused; the series may, however, be seen complete on the upper surface of the forewing and lower surface of the hindwing in many specimens of *Callidryas philea* and *C. thalestris* ♀ (Fig. 22, S 1—11).

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In certain genera (*Eronia, Euchloe,* etc.), the presence of a fifth subcostal nervule gives rise to an additional interspace in the forewing; this, however, causes no difficulty, inasmuch as the extra interspace so formed is never occupied by a distinct spot. If necessary, the additional subcostal interspace may be referred to as 5a; by which plan we shall avoid throwing the numbering out of correspondence with that adopted in the other genera (see Fig. 23). In those genera (*Pereute, Delias,* etc.) which possess only three subcostal nervules in the forewing, I shall for convenience consider S 4 as absent.

Having identified the series S in the species named, we shall find no difficulty with the remaining members of the genera *Synchloe* and *Tatochila,* all of which possess it in a condition of greater or less development. In all these cases, if the sexes differ, the female invariably presents the series in greater completeness; though such of the spots as are present in the male are sometimes more distinct. Thus in *S. hellica* ♀, the whole range occurs with the exception of S 9 (this being also the spot which is regularly small or absent in *S. callidice* and *S. daplidice* ♀), and the spots show a great tendency to fuse into a submarginal band, especially towards the costa of the forewing. In the male, however, all are absent from the hindwing, and S 9—11 also from the forewing; S 8 is distinct; S 7 hardly visible; and S 2—5 are fused into a single spot which is more distinct than the corresponding patch in the female.

The same submarginal series can be traced with equal certainty in the genus *Belenois.* Here again the series is as a rule more complete in the females, while the individual spots are more distinct in the males. This can be well seen for example in *B. mesentina* (Fig. 13), where the males show a submarginal band on the forewing which can without difficulty be resolved into a series of five spots, representing S 2—3, 5, 6, 7 and 8. On the upper surface of the females the spots show a greater tendency to fuse with one another, and with the dark area of the apex and hindmargin; they are nevertheless in most specimens recognizable on the upper surface, and nearly always fairly distinct beneath. Much the same is the case with the submarginal series on the hindwing; this is constantly present in a distinct form on the under surface of both

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sexes, and also to a variable extent on the upper surface of the male. The whole range (except the last member, S 20) occurs constantly on the upper surface in the female, but shows a strong tendency to fuse with the dark marginal band of the wing. In both male and female of this species the conspicuous and persistent spot S 8 occupies a prominent position, being pushed back as it were towards the centre of the wing, and so causing an indentation in the submarginal row. In *B. severina* the series is generally less well-marked than in *B. mesentina*, being to a great extent fused with the dark marginal band; S 10 and 11, however, which are absent in the latter insect, are mostly visible in *B. severina* ♀. *B. calypso* is noticeable as having the present series particularly well-marked on the underside of the hindwing; in the female it is also well in view on the upper surface. *Pinacopteryx larima*, again, has the series well developed on the hindwing, and recalls some species of *Synchloe* and *Ganoris* by the prominence given to S 8, 10, and 11. In several species of *Belenois*, as for instance *B. teutonia* ♀ and *B. coronea*, the fusion of the spots of series S with one another and with the dark apical and marginal area is almost or quite complete. (See *B. peristhene*, Fig. 14).

The genera *Appias*, *Catophaga*, and *Hiposcritia* present us in many of their members with the same series, more or less developed. In *H. lalage*, for instance, S 1—9 are fairly well marked on the forewing (most distinctly on the underside); while some spots of the series are also in most cases visible on the hindwing. In the greater number of species, however, the series is so fused with the dark apical and marginal area as to be hardly distinguishable (as in *C. zamboanga* ♀), or is altogether obsolete (as in most specimens of *A. nero*). It is noticeable that the spot S 8, to which I have before drawn attention, is usually the last to disappear from the forewing; and that in many cases where S no longer exists as a separately recognizable series, the place of S 8 is indicated by a prominent projection inwards of the fused marginal area (Figs. 9, 10, 11). The underside of the hindwing often retains traces of the submarginal series when the upper surface of one or both wings has entirely lost them (*C. lankapura* ♀ and some specimens of *A. nero*).

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In the genus *Delias* the same assemblage of spots meets us again, though scarcely in a very definite form. The well known *D. eucharis* (Fig. 5) shows the series on both surfaces of each wing, the spots being to a great extent merged with one another; the band formed by their fusion is nevertheless quite distinct, and its indentations correspond with the usual disposition of the spots on the wing in those species where they exist in a more discrete condition. The series is also visible in *D. hyparete* (underside); and the same range of markings is present as a sinuous band in the Australian *D. aganippe* (best seen in the female, and on the underside); in less distinct form in *D. harpalyce*, and still recognizable, though now almost completely merged, in the closely allied *D. nigrina*. A comparison of the upper surface of the wings of the last named insects with those of other species of the genus *Delias*, such as *D. belladonna* (Fig. 4), *D. pasithoe*, and *D. thisbe*, serves to suggest the manner in which the submarginal series (in common with other features) may have arisen—namely, as a survival of an original dark ground-colour, which has become broken up, first into irregular bands and finally into spots, by the appearance and gradual enlargement of touches of a lighter colour in the spaces between the nervules. Further reference will be made to this point when other markings, whose history appears to be similar to that of the present series, come under consideration.

Metaporia agathon (Fig. 7) presents the series in much the same condition as *D. eucharis*, the band is, however, somewhat thicker and less defined. It is easy to trace the same feature through many species of the genera *Pontia* and *Huphina*; thus in *P. soracta* it is met with in the hindwing as a series of faintly-developed acute-angled chevrons, pointing outwards (as in *Tatochila*). In the forewing, S 3, 5—9 are easily visible. It is noticeable that S 8 is in this insect exceptionally small; it retains, however, its usual tendency to break the line of the series by advancing further than the others towards the centre of the wing. In *Pontia cratægi* the whole series has vanished; but in *Huphina coronis*, *H. phryne* (Fig. 8) and others, it is well marked; the most persistent spots being, as in other genera, S 6, 8 and 10; and the same general differences between the sexes, in relation to the series, being observable here as in *Synchloe*

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and *Ganoris*. Indications of the series, more or less pronounced, can also be seen in *H. timnatha*, *H. aspasia*, *H. judith*, *H. nama*, and other species.

The strong resemblance to *Delias belladonna* borne by *Prioneris thestylis* is very probably due to mimicry, as suggested by Wallace ("Pieridæ of the Indian and Australian Regions," Trans. Ent. Soc. Lond., 3rd series, iv., pp. 309, 383). But from the presence of traces of the submarginal series in other species of *Prioneris* (as in *P. autothisbe* and *P. clemanthe*), it seems likely that it is rather the retention than the origin of the submarginal series in *P. thestylis* that is attributable to this cause. Material for the production of a likeness of *D. belladonna* was no doubt already to hand in the existence of an homologous series of markings in both insects. Other species of *Prioneris*, not having the same reason for keeping close to the original design, have strayed away more or less widely from it.

Mr. Wallace has also pointed out the agreement in some respects between *Delias* and the South American genus *Euterpe* (ibid., p. 344). If, with Mr. Butler, we divide Swainson's genus *Euterpe* into *Pereute*, *Leodonta*, *Catasticta* and *Euterpe* proper, we shall find that while all the normally coloured species of the group are demonstrably linked with one another and with *Delias* by their general system of marking and scheme of coloration, two of the genera (*Pereute* and *Leodonta*) further suggest a near relationship with *Delias* by the peculiarities of their neuration; there being in these instances only three instead of four subcostal nervules in the forewing (Butler, "Revision of the Genera of the Subfamily *Pierinæ*," Cistula Entomologica, vol. i., 1870, pp. 39, 40, etc.). The appearance of several species of this group of genera (notably *Euterpe tereas*) has been profoundly altered by mimicry; but putting aside such forms as these, we shall find no difficulty in tracing a common pattern throughout most of the remaining members of the group. This pattern is not dissimilar from that which characterizes those species of *Delias* which we have seen to be probably the older (*e.g.*, *D. belladonna*, *D. pasithoe* and *D. thisbe*). To this part of the subject I shall return later, at present it will be sufficient to point out the distinct presence of the submarginal series S in such examples as *Catasticta*

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nimbice, *C. anaitis*, *C. bithys*, and to a less degree in *Leodonta dysoni* and *L. tellane*. The close resemblance between the remarkable Pierine *Eucheira socialis* and *C. bithys*, in respect of the marking of the upper surface, may warrant us in identifying the corresponding portion of the wing in the former insect with the submarginal row S undoubtedly present in the latter (Figs. 1, 2).

The series S having now been traced through several genera, until it, so to speak, loses itself in such generalised, and apparently primitive forms as those presented by *Delias belladonna*, *Catasticta bithys* and *Eucheira socialis*, it will be advisable to return to the genus *Synchloe*, and seek thereabouts for a new starting-point from which to pursue the same series through its developments in a fresh assemblage of genera which have not at present been noticed. Such a starting-point may be found in a comparison of *S. daplidice* ♀ with the female of almost any species of the genus *Colias*. A short examination will show that the same submarginal series exists in the latter genus. A good species for the purpose is *C. hyale* (Fig. 20), in which both sexes exhibit the series distinctly. The constituent spots broaden out towards the costa and tend to become fused with one another and with the black patch at the apex. This tendency is carried further in many species of *Colias*, particularly in the males, where, as in *C. edusa*, marginal and submarginal markings are fused together into a deep dark border. The females, however, preserve the spots of the submarginal series in a more discrete condition. In most species of *Colias* S is well developed on the under surface, the component spots being usually black on the forewing, and on the hindwing orange or pinkish. In a few species, such as *C. phicomone* and *C. palæno*, the series is obscured or absent. *Meganostoma*, which resembles *Colias* so closely in other respects, shows also the submarginal series on the under surface; usually as a row of somewhat faint pinkish dots, which are clearly identical with S in *Colias*.

Through *Meganostoma* the passage is easy to *Gonepteryx* and *Amynthia*. In *G. rhamni* and *G. cleopatra* no vestige of S is to be seen on the upper surface; on the lower surface, however, of many of the males and most

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of the females, it is visible in the hindwing, and near the apex of the forewing, as a series of minute brownish dots; similar to, but as a rule even smaller than, those of *Meganostoma*. *Rhodocera leachiana* and *Amynthia mœrula* show exactly the same feature, the spots being dark brown or black, and a vestige of the series is present in *A. clorinde*. In the closely-allied genus *Dercas*, S is curiously modified into a brown or orange streak passing in an almost straight direction from the apex of the forewing to the anal angle of the hindwing. In *D. wallichii*, S 8 is large and prominent; but the remainder of the series is scarcely visible on the upper surface, though easily recognisable below.

In the genera *Callidryas*, *Catopsilia*, and their allies, the extent to which S is developed varies within wide limits. *Callidryas philea* ♀ has already been noticed as presenting, on the upper surface of the forewing, in many specimens, a complete set from S 1 to S 11 (Fig. 22). In this, as in other species of the genera named, it is usually S 7 and not S 8 that breaks the line by advancing towards the centre of the wing. The series is not usually continued on the upper surface of the hindwing, but both wings show it tolerably well below. S is well developed on the upper surface of *Catopsilia flava* ♀ (Fig. 21), and is visible to a variable extent on both surfaces (except the upper surface of the male) in *C. catilla*, *Aphrissa godartiana*, and others. In some of these insects S on the under surface forms part of the characteristic brown or pinkish mottling of the wing; in others, as the male of *C. phlegeus*, it is almost or quite reduced to the condition of minute pink spots, like those of the genus *Gonepteryx*. It is worth noticing that on the underside of *Phœbis trite*, S takes in the forewing the form of a straight streak, not unlike that in *Dercas lycorias*, leading diagonally across the wing. On the hindwing a similar streak appears, which, however, does not represent S as the apparently corresponding streak in *Dercas* undoubtedly does, but is at least partly developed from another system of spots which will be noticed later. Attentive examination will disclose the existence of traces of the true S between the streak in question and the hind border of the wing.

In *Hebomoia* the series is always at least partly visible on the forewings, and often on the hindwings as well.

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The component spots are usually large and distinct, as may be especially well seen in *H. glaucippe* ♀ (Fig. 19). The same insect also shows the series tolerably well on the under surface, where it is in other members of the genus, as a rule, somewhat lost in the general mottling of the wing.

S is often well seen on the underside of species belonging to the genus *Ixias*, where it assumes a condition very like that which obtains in *Colias*. In *I. marianne* it is especially well developed, and the component spots on the hindwing are often furnished with pale centres. Some members of the series are frequently also visible on the upper surface, as in *I. marianne* ♀, where S 6—9 are conspicuous (Fig. 18).

The genera *Teracolus*, Swains., *Idmais*, Boisd., and *Callosune*, Doubl., are united by Mr. Butler as *Teracolus*. In most of the species included under this head, the series now being discussed is distinctly visible, especially in the female and on the under surface. Good examples of the series are furnished by *T. danae* and *T. etrida*. In *T. eucharis* ♂ it has mostly vanished from the upper surface; S 8, however, remains, as in so many other instances, and is, moreover, in this insect often reinforced by the presence of S 13 and 14, which spots have been also seen to persist in our common species of *Ganoris*. The female of *T. regina* possesses S in a well-developed condition on both surfaces, S 10 being especially conspicuous. The same series is visible to a less degree in the female of *T. ione*. The males of both species show indications of S on the lower surface, but none on the upper. The series may also be seen in a well-developed state in *T. hewitsonii* and *T. amata* (Fig. 17).

In *Euchloe* the series has almost disappeared. A relic, however, persists near the apex of the forewing in some species, best seen, perhaps, in *E. tagis*, *E. ausonia*, and *E. hyantis*; while *E. reakirtii* ♀ shows S on the upper side of the forewing very distinctly; S 8 indenting the line as in the genus *Synchloe*. A comparison of the under surface of the hindwing in *E. cardamines* and *E. eupheno* with the somewhat similar system of marking in *S. daplidice* suggests also the probability that part of the green mottling in *Euchloe* represents the submarginal series. The same series is certainly visible on the upper surface of the hindwing in some specimens of *E. lucilla* ♀.

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Certain species of *Nepheronia*—for example, *N. jobæa* ♀ and *N. valeria* ♀—show the series S in a form that strongly recalls the condition of the same series in *Metaporia agathon*. In both *Nepheronia* and *Eronia*, however, S is very apt to be merged, especially on the upper surface, with the dark marginal area. The female of *E. leda* (Fig. 23) shows the first few spots of the series on the upper side of the forewing in a condition resembling that in some species of *Callidryas*, which resemblance applies also to the lower surface, where S occurs in a modified form on both wings, traces of the same series being likewise visible in the male.

Summary.—Most of the members of the subfamily *Pierinæ* possess, in a greater or less state of development, a submarginal series of dark spots. The genera *Synchloe, Belenois, Tatochila*, and some species of *Colias*, amongst others, present the series in a fair state of completeness. In other members of *Colias*, and in several genera such as *Ixias, Hebomoia*, and *Teracolus*, the series is often less distinguishable, owing either to fusion of its constituent spots with each other and with the dark marginal area, or to suppression of some of their number. Relics of the series remain in *Ganoris, Euchloe*, and other genera, being especially persistent in the female sex; in *Gonepteryx, Dercas, Callidryas, Phœbis, Catopsilia*, and other allied genera, the series often undergoes curious modifications. The aspect of the series in such genera as *Pontia, Huphina, Metaporia*, and *Nepheronia*, suggests its development from portions of the original ground-colour left (by the formation and subsequent fusion of lighter patches in a dark or dusky area) as a dark band following the contour of the wing; and, finally, by an extension of the process, as a submarginal chain of spots. The possibility of such a mode of origin is well illustrated by the condition of the wings in many species of the Eastern genera *Prioneris* and *Delias*, and the Western *Leodonta, Catasticta*, and *Eucheira*.

2. *The dark marginal area or spots.*

In nearly all our common *Pierinæ* we find a dark patch at the apex of the forewing; better marked, as a rule, in the females than in the males. In *G. brassicæ*

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it is large and crescent-shaped, extending for some distance along both costa and outer margin of the wing. In *G. rapæ* ♀ it is not as a rule prolonged very far on the outer margin, but it still reaches some way along the costa. In the male of the same insect it is generally small, and confined to the actual region of the tip. In neither of these species is there much indication of resolution, except that in most specimens of *G. brassicæ*, especially in the females, the hinder arm of the dark crescent shows an irregularity due to the massing of black scales about the marginal terminations of the nervules. But in *G. napi* (Fig. 16) resolution is generally well marked; and it becomes evident that the dark crescentic or triangular area of the tip is really formed by the fusion of the anterior members of the series S, which we have just been considering, with another series, which may be called M, occupying the actual margin of the wing, and consisting, in its fully resolved condition, of a row of dark spots, each of which is traversed by the peripheral portion of one of the nervules. It is noticeable that in this species the black marginal spots are often found extended, especially in the female, in the form of a powdering of dark scales along the course of the nervules towards the base of the wing.

Turning to *S. daplidice* (Fig. 15), we find the constituent elements of the apical patch still better shown than in *G. napi*. The marginal and submarginal series are always distinct, being separated from one another by portions of the general white colour of the wing, which take the form of a row of white spots on the dark apex, usually four in number. Either of these two species serves well to illustrate an important difference between the spots of the two series, S and M. The spots of the former series occupy, as we have seen, the interspaces between nervules; and when fusion between adjacent members of the series takes place, it does so by an extension of dark scales across a nervule. On the other hand, each of the spots of the latter series is centred, not in an interspace, but around the peripheral portion of a nervule or nervure. Thus the spots of the two series tend to alternate with one another, though this effect is to some extent interfered with by the frequent fusion of some of the spots with others of the same

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series. It is further noticeable that in both of these insects the marginal series M is usually continued in the form of a row of dots smaller than those helping to constitute the apical patch, but still distinct, along the outer border of both fore and hindwing. In *S. daplidice* ♀ (Fig. 15), the submarginal series being also distinctly present on the hindwing, the alternate arrangement of the two series is in this situation very apparent. The constituent spots of series M may be numbered for convenience, in the forewing 1—11, in the hindwing 12—20, one being counted for each nervure or nervule that reaches the margin; and the same allowance may be made as was suggested in the case of S for the occasional suppression of a fourth or addition of a fifth subcostal nervule (see p. 255).

Many examples of the occurrence of this marginal series can be found among the near allies of the species just named, and in all of them there is a tendency towards the formation of a dark apical patch by the union near the tip of the forewing with the anterior members of the submarginal group S. In *G. gliciria* many members of the series are usually present, often tending in the females to form by fusion a broad marginal band in both fore and hindwing. Other species of the genus *Synchloe* besides *S. daplidice* present M in a fairly well-developed condition. It is usually conspicuous in the female *S. callidice*, *S. protodice* and *S. hellica*, and to a less extent in the males of the same insects; where it clings longest, as in the common species of *Ganoris*, to the region of the tip. *Tatochila autodice* and *T. theodice* show M in very nearly the same condition as the species of *Synchloe* last named.

Turning to the genus *Colias*, we find that the marginal series has undergone some modification. In the males it is often completely fused with the submarginal series, the two together forming a broad outer band to the wing, as in *C. edusa* ♂. The same may also take place in the female, as in *C. palæno*; but in most cases the two series, S and M, are in the female more or less distinct, being marked off from one another by areas of ground colour which take the form of a row of light-coloured spots, not unlike those present in many species of *Synchloe* (see p. 263). In some instances, as in *C. hyale* and *C. phicomone*, this description applies also

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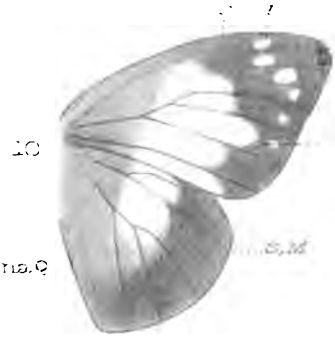
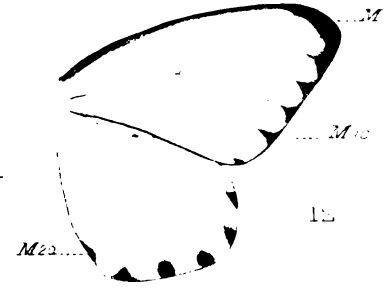
Catophaga paulina ♀



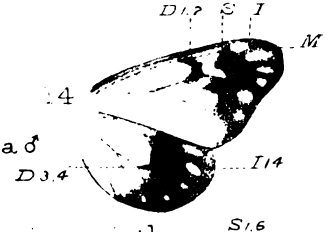
Appias clementina ♀

Hebomoia lalage



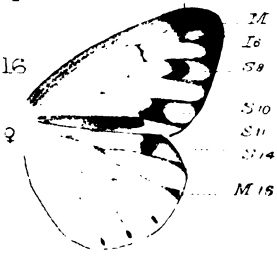
Mylothris agathina

Belenois mesentina ♂



Belenois peristhene

Gonepteryx cleopatra ♀



Gonepteryx rhamni ♀

West, Newman lith.

Wings of Pierinæ.

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to the males. Most species show a strong tendency for the spots S 8 and M 8—9, and, in a less degree, S 10 and M 10—11, to become fused with one another by the obliteration of the separating patches of pale ground colour. The individual members of series M are usually more distinct from one another on the hind than on the forewing. Not infrequently they are fused into a complete band in both. On the lower surface M is in this genus rarely if ever visible; thus offering a strong contrast to S.

In *Meganostoma* the fusion of M with S is usually complete on the forewing; the females, however, of some species show traces of a separation; a few patches of the yellow ground-colour, like those in the females of many species of *Colias*, appearing in the midst of the dark border. In some forms, as *M. philippa* ♀, these light patches become much enlarged, and the two series S and M are as distinct from one another as in any species of *Colias*. *M. cesonia* usually shows the spots well on the upper surface of the hindwing; and in most species of this genus, M is often visible beneath as a row of minute pinkish dots on the terminations of the nervules at the margin.

In *Gonepteryx*, *Rhodocera*, *Amynthia*, and *Dercas*, the series is not as a rule strongly developed. *G. rhamni* usually shows on both surfaces a row of marginal dots, dark red or brown above and pinker beneath, at the outer extremities of the nervules, which are undoubtedly relics of M. These are best marked at the tip of the forewing, where they often tend to run into a thin continuous marginal line, and are generally more apparent in the female. The apical band is more strongly accentuated in *Rhodocera leachiana*, especially in the female, in which sex also M is often found on the hindwing in a fairly developed condition. Traces only of the series are visible in the species of *Amynthia*; but in *Dercas* M is reinforced by the anterior portion of S, and helps with it to form a conspicuous dark area at the region of the tip.

The condition of M in *Hebomoia* needs no special remark, except that on the under surface its separate existence appears to be sacrificed to the exigencies of the protective pattern.

In *Callidryas*, *Metura*, *Phœbis*, *Aphrissa*, and *Catop-*

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silia, the development of M varies. Most of the species, however, show the usual tendency of M to expand into an apical patch, either with or without reinforcement from S. The members of the series are generally reduced on the lower surface of the hindwing to a row of marginal dots; and the great characteristic of the present series, namely that it belongs to the nervules, and not, like the former one, to the interspaces, is kept up throughout. On the upper surface of *Catopsilia flava* ♀ (Fig. 21), M and S are both well developed, and their relation to one another closely resembles that which obtains in *Colias*.

The same series is often present in the genera *Ixias* and *Teracolus*; being, as usual, most constant in the females, and most prominent on the upper surface. It appears occasionally as a chain of spots, as in the hindwing of many specimens of *T. ione* ♀, and some of *T. regina*, but more often as a simple marginal band, as in *I. marianne* (Fig. 18). This band may be completely fused with S, as in the hindwing of *T. phisadia*, or partially so, as in *T. amata*. A plain marginal band, in the forewing expanding at the tip and more or less indented opposite the branching of the median nervure, in the hindwing sometimes breaking into a chain of spots, is also the usual condition of M in the genus *Terias*.

In *Nepheronia* and *Eronia* M is generally present as a well-developed marginal band sometimes more or less fused with S, and often sending dark prolongations inwards along the course of the nervules. In some species, however, as *N. thalassina* and *E. leda*, it is mostly confined to the apical region; in the latter indeed it is absent from the hindwing of the male altogether, and barely visible on that of the female (Fig. 23). The series in *Euchloe* is generally recognizable as a row of dots, sometimes fused at the apex with the anterior members of S; but often, as in *E. tagis* and *E. ausonia*, preserving its independent existence.

The condition of M in the genera *Metaporia* and *Huphina* recalls that in *Nepheronia*; the constituent spots being generally fused into a marginal band from which dark offshoots run inwards, accompanying the course of the nervules. A similar description will apply to *Pontia*, though in this genus the dark markings are often greatly

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reduced. *P. soracta*, however, shows M with sufficient distinctness; and even in *P. cratægi* M itself is in some instances visible, while the dark prolongations along the course of the nervules is a well-known and conspicuous feature.

Delias and *Prioneris* help to show us what is in all probability the earliest condition of the present as well as of the former series. The upper surface of both fore and hindwing in the female of *D. eucharis* presents once more the familiar pattern of *Metaporia agathon* and *Nepheronia gæa* ♀. It has already been pointed out that there is an easy passage from this system of marking to that which we find in *D. belladonna*, *D. pasithoe*, and several other species; while the same features are undoubtedly visible with but slight modification in the American genera *Euterpe*, *Catasticta*, *Leodonta*, and *Eucheira* (see p. 258). A comparison of the insects just named, to which may be added *Prioneris thestylis* and other species of the same genus, can hardly fail to suggest the probability of the origin of both M and S as portions of the original dark ground-colour marked off from one another with gradually increasing distinctness by the appearance, enlargement, and confluence of whitish patches in the interspaces between nervules. The alternate character of the two series S and M, when broken up into spots, is seen to be a consequence of the shape and position of the original dusky white touches that first bring them into view. These touches may be seen for example in *D. belladonna* (Fig. 4) to be divisible into two sets, which we may call marginal and basal, both occupying the central areas of the interspaces. Between the two sets is included the portion of ground colour corresponding to S, the constituent spots of which, when isolated, will necessarily have their centres in the interspaces. But the marginal set of light marks tends to reach by tapering extremities to the edge of the wing (see Fig. 5); so that the interposed marginal patches of unaltered ground colour, forming the first beginnings of M, are of necessity focussed round points in the nervules and not in the interspaces. And when in consequence of the further development and fusion of the white or pale markings, the marginal relics of dark ground colour become reduced to a row of isolated dark spots, these spots are, as we have already seen in *S. daplidice* (p. 263)

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and other cases, always traversed by the peripheral portion of a nervule or nervure. This fact is well exemplified by *M. agathina*, *M. poppea*, and several other species of *Mylothris* (Fig. 12).

The invasion of white, which is already considerable in *D. eucharis* ♀, becomes still more predominant in the male of the same insect, where, however, the original ground-colour still persists, not only in the series S and M, but also in the form of the dark streaks accompanying the nervures and nervules, a feature which we have seen to be common in many other genera, especially *Pontia*, *Huphina*, *Metaporia*, and *Nepheronia*.

Without leaving the genus *Delias* we can find several examples where the intrusive white has ousted the whole of the original ground-colour, except at the margins and apex. This is the case for instance in *D. descombesii* ♂, *D. agostina* ♂, *D. cœneus* ♂, and *D. momea*. In most of these species the dark marginal area is plainly composed of S and M in a more or less complete state of fusion, and it is noticeable here as elsewhere that the female almost invariably retains a larger proportion of the original ground-colour than the male.

Many species of *Belenois* resemble the last mentioned species of *Delias* in the tendency towards fusion of the marginal and submarginal series. *B. peristhene* (Fig. 14) is exceedingly like *D. momea* in this respect, and in *B. teutonia* ♀ and *B. coronea* the fusion is still more complete. But in very many species of *Belenois* and *Pinacopteryx*, S and M are plainly distinguishable from one another; and in some, as in *B. calypso* (as also in *Pinacopteryx capricornus*), the resolution of both into a row of dots is complete. The formation of a series of rings along the margin of the hindwing (as in *Synchloe callidice* ♀, *S. protodice* ♀, etc.), by the union of the horns of the crescents or chevrons belonging to series S with the spots of series M, is a noticeable feature on both surfaces of many specimens of *B. mesentina* ♂ (see Fig. 13); and the identity of the whole arrangement of the submarginal and marginal series in *Belenois* with that in *Synchloe* becomes perfectly evident on a comparison of *B. mesentina* with *S. johnstonii* or *S. hellica*.

In *Appias* the two series when present are not sharply marked off from one another. In some species, however, S has almost or quite disappeared, and M may persist

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alone as a marginal band, showing more or less tendency towards resolution (*Appias lyncida* ♂, *A. celestina* ♂, etc.).

Summary.—The present, like the preceding series, is thus seen to be a relic of the original dark ground-colour. It is intercepted between the margin of the wing and a series of pale touches (best seen in certain species of *Delias* and *Catasticta*) that making their appearance in the submarginal region of the interspaces, more or less isolate, indent and divide up the dark marginal area. It may eventually disappear altogether (as in some specimens of *G. rapæ* ♂), but usually persists on the forewing, at least, in the region of the apex. When present, it shows great variation in the extent to which it is resolved into separate spots, and also in the amount of fusion it undergoes with the neighbouring series S. As a general rule it is, like the last-named series, more constantly present in the female sex, and more completely resolved in the male.

3. *The light series between* 1 *and* 2.

The region of pale ground-colour included between the two dark-coloured series S and M, becomes of necessity more sharply defined and circumscribed as the constituents of each dark series become fused together into bands instead of remaining as rows of spots. The tendency so often seen of the two dark series to become partially fused with one another, by the extension between them of dark lines following the course of the nervules, leads, when carried far enough, to the splitting up of the included pale area into a series of pale spots, which sometimes attain a very distinct and definite character, especially at the apex of the forewing. These pale spots have already been incidentally noticed during the discussion of the two series between which they lie; it will not be necessary to do more in this place than to suggest that, for the purpose of separate reference, the letter I should be taken to represent the whole series, the possible constituents being numbered 1—20, in correspondence with the dark spots of series S which bound them on the inner aspect. (See Figs. 1, 2, 5, 21, etc.)

4. *The discoidal spots.*

In none of our three common species of *Ganoris* does

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there exist a true discoidal spot. The nearest approach is to be found in *G. napi*, where the disco-cellulars of the forewing, together with the other nervules, are in many specimens accompanied by a sprinkling of black scales; which in some instances are sufficiently numerous in this particular region to give almost the appearance of a black discoidal spot or patch. This may be best seen in specimens of *G. bryoniæ*, but dusky specimens of the ordinary *G. napi* will sometimes show the tendency almost equally well. The same tendency is carried a little further in *Tatochila autodice*, while *T. theodice* shows the corresponding marks in a condition of strong development, with a slight indication of a similar feature on the hindwing as well. Passing to the genus *Synchloe*, we find the discoidal spot invariably present, at least in the forewing; and in most species large and distinct, especially in the females. *S. daplidice* (Fig. 15) has the spot well developed on both surfaces; on the lower surface it is more or less shaded with green. The same is the case with the somewhat smaller discoidal spot in *S. callidice*. Another example of a large and conspicuous discoidal spot is furnished by *S. hellica*.

In *Colias*, a discoidal spot is nearly always present on each surface of both fore and hindwings. On the upper surface of the latter it is sometimes independently present and sometimes only shows through from beneath; but it is seldom absent altogether. The spot on the forewing is in this genus, as in *Synchloe*, usually dark brown or black. It may be ringed or pupilled with orange; in the former case the orange is of a deeper shade than the general ground-colour. Examples of this may be seen in *C. meadii*, *C. cunninghamii*, and others. In *C. fieldii* and *C. edusina* the discoidal spot in the forewing is unusually large; in no species of *Colias*, however, does it overpass the boundaries of the subcostal nervure in front and the third median nervule behind. It may be very small, as in *C. barbara*; or entirely absent, as in some specimens of *C. palæno* and *C. pelidne*. On the lower surface it is often centred with white or silver. On the upper surface of the hindwing, the spot when present is not dark, but varies in different species from the palest yellow to a full orange. It is distinguished from the general surface of the wing either by its different shade of yellow or orange (as in *C. hyale*)

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or by its freedom from admixture with the darker scales that often give the hindwing in this genus a comparatively dusky appearance (as in some specimens of *C. edusa*). In many species a small companion is visible in the interspace between the second subcostal and discoidal nervure. On the under surface the discoidal spot is much more distinct. Its centre is silvery white, and it is usually encircled with a brown or orange ring, which in some species is sharply marked off both internally and externally by thin marginal lines of a darker colour. The companion reproduces the discoidal spot on a smaller scale. It always occupies an interspace, whereas the chief discoidal spot is situated upon the second disco-cellular nervule. (Fig. 20, D 4.)

No doubt is likely to arise as to the identity of the discoidal spot in *Synchloe* with that in *Colias* so far as the forewing is concerned. The chief difference between them is that in the former genus the spot is less sharply defined and less regular in outline; moreover in *Synchloe* it frequently reaches forward to the costa, and it may extend backward to the space between the first and second median nervule; whereas in *Colias*, as we have seen, it does not pass the limits set by the subcostal nervure and the third median nervule. But there can be no reasonable question that the spots are homologous in the two cases; and a comparison of the two genera further suggests the probability that in *Synchloe* we have an older, in *Colias* a newer and more specialised form of the marking. This conclusion accords with what has been already said about the marginal and submarginal series of markings, which in *Colias*, especially in the males, have departed somewhat further from the original type than in *Synchloe*; and it will be seen to receive further confirmation from what is to follow. With regard to the discoidal spot on the hindwing, although it is perhaps not at first sight clear that the markings in the two genera are really homologous, it is nevertheless quite possible, on an attentive examination of allied forms, to trace the steps by which the passage from one to the other is effected. In the hindwing of many species of *Synchloe* there is no indication of a discoidal spot at all; in others, however, a definite aggregation of black scales is visible about the disco-cellular nervules. In some species, such as *S. protodice* ♀,

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the nervules, though surrounded with black scales, are themselves covered with white, or (on the underside) pale yellow scales; a light-coloured centre being thus provided for the dark discoidal patch. In the genus *Tatochila* this light-coloured centre acquires greater importance. On the under surface of *T. autodice* the white scales are seen not only covering the disco-cellular nervules, but also intruding some way upon the yellow of the general surface; in this species, however, the pale patch thus formed has no dark border. But there can be little doubt, on a comparison of *T. autodice* with *Colias palæno*, that the whitish area surrounding the second disco-cellular nervule in the one is homologous with the silvery patch in the corresponding region of the other; while the identity of the discoidal marks in *Tatochila* with those in *Synchloe*, and of the same marks in *C. palæno* with those in other species of *Colias*, is a matter of certainty. The brown ring surrounding the silvery pupil on the under surface of most species of *Colias* is indicated in *C. palæno*, where its general appearance points to the probability of its origin from the dark scales that have already been noticed as gathering about the region of the disco-cellular nervules in *Synchloe*. In *C. palæno* itself, however, the central pale patch (as in *Tatochila*) becomes far more prominent than the surrounding dark border. An examination of the discoidal spot on the underside of the hindwing in *Gonepteryx rhamni* ♀ and *Amynthia mærula* will disclose the same general arrangement of a pale area traversed by the second disco-cellular nervule, and surrounded by a ring of darker scales, that we have already seen to be characteristic of the spot in other genera. In these insects, however, as in *Rhodocera leachiana*, the spots, though clearly identical with those in *Colias*, are in a lower state of development and specialization. Turning again to the discoidal spots on the forewing, we may at first sight hesitate to identify the bright orange spots in *G. rhamni* or *G. cleopatra* with the black spots or patches in *Synchloe* and *Colias*. But in *Amynthia clorinde* we have what is unmistakably an intermediate form of the spot, in which the vivid orange of the one closely encircles the deep brown or black of the other, and from which either the *Gonepteryx* or *Colias* type of spot might be easily derived. Much the same is the case with *R. leachiana*;

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but in this insect the black markedly predominates. The discoidal spot in the forewing of *R. leachiana* is also noticeable as having a small companion, of similar character but with a greater proportion of orange, in the root of the interspace between the subcostal and the first discoidal nervure.

The discoidal spots in *Dercas*, when present, correspond closely with those in the genera just named. The spot on the forewing of *D. lycorias* is like that in *G. rhamni*; it is, however, less compact, and surrounds both disco-cellular nervules instead of the second only, as in the latter insect. The spot on the upper surface of the hindwing is scarcely visible, but those on both wings beneath nearly resemble the corresponding marks in *R. leachiana*. On the underside of *D. wallichii* the marks are of the same character, but reduced in size; from the upper surface they are almost or quite absent.

In *Meganostoma* the discoidal spots, both above and beneath, so closely correspond with those in *Colias* as to call for no special remark. In *Callidryas, Metura, Phœbis, Aphrissa*, and *Catopsilia*, they present also the same general appearance. On the upper surface of the hindwing, the discoidal spot is seen as a rule faintly or not at all; but on the forewing there is often a well-marked dark patch, enclosing either the second disco-cellular, as usually in *Catopsilia thauruma* and *C. catilla* ♀, or both disco-cellulars, as in *Aphrissa godartiana* ♀. On the underside the form of a silvery circular patch, surrounded by a pinkish or brownish ring, is almost universally kept up. There is in some species (as in *Callidryas philea*) a tendency for the discoidal spot in the forewing to divide into two parts, one for each disco-cellular nervule; while in the hindwing the small companion which has been already noticed in *Colias* is nearly always present in the interspace between the discoidal and subcostal nervures. One or two species (as *C. florella* ♀) possess a second companion within the cell. The present series, when fully resolved, seems thus to consist of five spots, two belonging to the two disco-cellular nervules in the forewing, the third belonging to the interspace between the subcostal and discoidal nervures in the hindwing, the fourth to the second disco-cellular nervule, and the fifth to the discoidal cell,

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also in the hindwing. I propose to designate the system as D 1—5.*

The last-named genera exhibit a good deal of variation in the size of the constituent spots of D, and also in the breadth of the encircling darker ring. In *C. catilla* ♀, the latter, spreading widely out from the silver centres, and being reinforced in the hindwing by a similar development from certain of the spots of series S, forms a conspicuous dark red patch on the under surface of both primaries and secondaries. A similar tendency is seen in many specimens of *Callidryas thalestris* and other members of that genus. In all these cases the border of the discoidal spots on the under surface is assimilated in colour to the general character of the darker mottlings that form the prevailing feature of the wing-pattern. It is interesting to observe, in the case of *Phœbis trite*, that the straight diagonal streak already referred to (p. 260) as crossing the under surface of the hindwing is made up of elements belonging to both series S and D, as follows: The part between the two subcostal nervules is S 14; that between the subcostal and discoidal is D 3; the next, where the streak intersects the second disco-cellular, is D 4; it then skips a space, and reappears between the median and submedian nervures as S 19. That the homology of the different parts of this line has been correctly stated will be evident from a comparison of *P. trite* with *C. eubule* and *C. thalestris*, in which species the elements of the streak are visible in a separate condition. It is in *P. trite* particularly worthy of note that in those interspaces where D 3 and 4 form part of the streak, the corresponding members of S, viz., S 15, 16, and 17 (which are not wanted for this purpose), are visible well to the outer side of the streak; whereas in the other interspaces there are no marks between the streak and the margin, the members of S having been, so to speak, used up for another purpose, and having thus caused an apparent interruption of the usual submarginal pattern. In the interspace between the first and second median

* This use of D is open to the objection that the same letter has also been used for an entirely different set of markings in the Nymphalidæ (see Trans. Ent. Soc. Lond., 1890, p. 91). But I do not think that this circumstance is likely to give rise to any practical difficulty.

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nervules, S 18 appears as a submarginal spot of the usual kind. Now, inasmuch as no member of series D ever occupies this interspace, there is no material at hand for continuing the streak; and, carrying the eye up to the apex of the interspace, where the streak should cross, we find it, in fact, deficient at that place.* This may seem a small point, but it is of interest as illustrating the absence of anything that might be called violent or arbitrary in the evolution of these various patterns, in which, indeed, the closer the examination the more difficult it is to find anything effected *per saltum*.

In *Ixias* the condition is again much the same as in *Colias*; the discoidal spot of the forewing, however, is often united on the upper surface with a dark band running across the wing from the costa to the anal angle. A similar feature occurs in *Hebomoia glaucippe* (Fig. 19) and other species of the same genus. On the lower surface the discoidal spot varies considerably in size, and in a few cases (as sometimes in *I. marianne*) may be absent altogether. When it is large, as in other specimens of *I. marianne*, it is frequently centred with white. In the hindwing the series is absent from the upper surface, and represented below only by D 4, which may also be white-centred, or may exist as a simple black dot of varying size.

In *Teracolus*, D is usually well marked. In some species, such as *T. vesta*, *T. hewitsonii*, and *T. puellaris*, it occurs on the forewing as a conspicuous black patch covering both disco-cellular nervules, and usually merged anteriorly in a dark or dusky band which extends along the costal border. In other species, as *T. evanthe*, *T. ione*, *T. regina*, etc., it takes the form of a circumscribed black spot, sometimes minute or absent. On the lower surface, the scales on and surrounding the disco-cellular nervules are often whitish, thus giving D a pale centre. D in the hindwing, when present, is usually small; on the underside of some species, as *T. danae*, *T. evippe*, and *T. omphale*, it is centred or shaded with orange;—this tint belonging primarily to the disco-cellular nervules, and spreading more or less widely from them.

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* As above noted (p. 260), the corresponding streak in the *forewing* of *P. trite*, and the somewhat similar feature on both wings of *Dercas lycorias*, are entirely formed out of series S.

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In *Terias* and *Sphænogona*, D is constantly absent from the upper surface, but is usually visible below, where it may appear as a small black dot or pair of dots in each wing (*T. lisa*), or as a group of more or less regular narrow-bordered rings (*T. hecabe* and *T. floricola*), or in various intermediate forms (*T. deva* and *S. gratiosa*). The transition from the condition of D in *Colias* to that in *Terias* is well indicated by *Xanthidia nicippe*, most specimens of which correspond pretty closely in the markings of the lower surface with the latter genus; while the upper surface of the forewing bears a discoidal spot much like that in some species of *Colias*. In the closely allied genus *Pyrisitia*, D has altogether disappeared (see *P. proterpia*).

The genus *Euchloe* shows the discoidal spot on the forewing in a well-marked condition (Fig. 24). It may exist as a distinct spot, as in *E. cardamines*, usually larger in the female; or as a more or less quadrangular patch reaching up to the costa, as in *E. lucilla*. On the underside it is often white-centred, as in *E. belemia* and others. On the hindwing, D is in many species of *Euchloe* not visible at all. In some, however, it appears as a small, at times very minute, patch of black scales surrounding the second disco-cellular nervule (some specimens of *E. genutia* and *E. cardamines*); in others, as *E. charlonia* and *E. lucilla*, it takes the form, on the under surface, of a pale circular patch, closely resembling D 4 of *Colias palæno* in the same situation.

D in *Belenois* is usually well marked on the forewing, as a rule enclosing both disco-cellulars, and often prolonged anteriorly to join the outer extremity of a dark costal band; this is especially the case in the female, and on the under surface in the male, as in *B. mesentina*, *B. teutonia*, *B. calypso*, etc. The spot is sometimes small and quite distinct, as in *B. creona*, D 1 being absent; sometimes, on the other hand, it is large and almost or quite merged in the general dark field of the outer portion of the wing, as in *B. coronea*. In the hindwing there may be no discoidal mark at all, as in *B. creona*; or all the nervures may be covered with dark scales (as generally on the under surface of *B. mesentina*), the disco-cellular nervules not being specially distinguished; or there may be a definite discoidal spot, composed of D 4, as in *B. mesentina* ♀, upper surface;

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and in *B. calypso*, under surface of both sexes and upper surface of female.

In *Appias* and *Catophaga* a discoidal spot can scarcely be said to exist; but in *Hiposcritia* and *Pieris* various members of the series D are often well marked. *H. lalage* ♂ (Fig. 11) has a conspicuous discoidal spot on both surfaces of the forewing, formed by D 2; and on the under surface of the hindwing there appears a minute representative of D 4. In *H. pandione*, D 1 and 2 compose a large spot which joins the dark costal band; while on the under surface of the hindwing, D 4 is sometimes indicated by a paling of the first disco-cellular nervule and the immediately surrounding area. In *Pieris* the forewing often shows a conspicuous discoidal spot, formed by D 1 and 2 or by D 2 alone; the hindwing as a rule possessing only a small dark representative of D 4 on the under surface, which in *P. buniæ* merely touches the second disco-cellular, but in *P. pylotis* encloses it.

In *Pontia* and *Huphina* (Fig. 8), D in the forewing appears generally as a mere darkening of the wing in the region of the disco-cellular nervules, more pronounced than the darkening of other nervures which is common in these genera, but not forming a definite spot. In the hindwing it is much less distinguishable or even absent (*P. cratægi*, *P. soracta*, *H. phryne*, *H. timnatha*, etc.). In *Metaporia agathon* (Fig. 7) the same darkening of the disco-cellular area occurs, which in *M. phryxe* takes the form of a definite and conspicuous patch. A like condition is seen in *N. gœa*, and other species of *Nepheronia*.

The correspondence in pattern of the genera *Delias* and *Prioneris* with those just discussed, already referred to on p. 267, applies to the present as well as to other features in the marking. *Delias*, moreover, shows in many species that paling of the disco-cellular nervules themselves, and sometimes of the immediately surrounding area in the midst of the dark discoidal patch, which we have seen to occur in *Synchloe* and other genera, and which in *Colias*, *Ixias*, and their allies leads to remarkable modifications in the general appearance of the discoidal spots (see *Delias aganippe*, *D. descombesi*, *D. crithoe*, etc.). In *D. belisama* ♀, the nervules remain dark, though there is a surrounding pale area.

Nothing special needs to be said about the genera *Euterpe*, *Catasticta*, *Leodonta*, and *Eucheira*. Their

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general correspondence in pattern with the old-world genera last named, which has been already referred to, involves a similar condition of the present series D. In none of them does any member of D assume the condition of a definite circumscribed spot; but in nearly all, the series exists as a portion of the original dark ground colour between the touches of intrusive white or yellow. In *C. toca*, D on the underside of the hindwing consists of an irregular dark ring with a yellow centre traversed by the disco-cellular nervules, this representing an early condition of the homologous ocellus in *Colias*.

Summary.—This series also, like those already treated of, represents a local survival of the original dark ground-colour. Appearing in the first place as an ill-defined accumulation of dark scales around the disco-cellular nervules, it takes the form of definite spots as the invasion of white or other pale ground tint progresses. As in the case of the other series, resolution is generally best marked in the males; the females showing a greater tendency to adhere to the ancestral condition. When fully resolved, the series consists of five spots, two for the disco-cellular nervules in the forewing, and one for the second disco-cellular in the hindwing, with two extra spots, also in the hindwing. In many instances the disco-cellular nervules, with a varying amount of neighbouring ground-substance, may appear as pale streaks or patches in the midst of the primitive agglomeration of dark scales; and in the further development of the pattern it may happen that either the pale or the dark markings alone persist; or both may be retained and worked up as in species of *Colias*, *Callidryas*, *Ixias*, etc., into a system of more or less elaborate ocelli.

5. *The markings on the underside of the hindwing.*

a. The yellow precostal streak.—A constant feature in our common species of whites is a deep yellow or orange streak which occupies the margin of the precostal space on the underside of the hindwing, and is clearly distinguishable from the pale yellow of the general ground-colour. This yellow precostal streak is conspicuous in other species of *Ganoris*, as *G. gliciria*, and may also be seen in *S. daplidice*, *S. hellica*, and many other members of the genus *Synchloe*. It is, I believe, never found in *Pontia cratægi*; in the closely allied *P. hippia* and *P.*

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soracta, however, it is well marked. *Metaporia agathon* and *M. phryxe*, which resemble the last-named species in other respects, also show a deep yellow mark in the same situation; but in this instance it occurs only as a spot bounded outwardly by the precostal nervure, and is not prolonged as a streak along the costa.* Many genera present this mark in much the same condition as the species of *Ganoris* first referred to; of which good examples may be seen in *Nepheronia thalassina*, *N. argia*, the curious *Herpœnia eriphia*, *Pinacopteryx pigea* and *P. capricornus*, *Mylothris chloris* and *M. agathina* (deep orange in these), *Tatochila theodice*, *Glutophrissa margarita*, *Appias zelmira*, *Phrissura sylvia*, *Daptonura lycimnia*, *Teracolus ione*, *T. regina*, *T. eris*, etc.

Looking back to *Synchloe hellica*, we find that the yellow precostal streak forms in that insect only one of a series of yellow marks, one or two of which partially occupy each interspace. A similar condition obtains in many species of *Belenois*; see for instance *B. mesentina* and *B. teutonia*. On the underside of the hindwing in these species, the dark lines following the course of the nervures, and the dark markings belonging to the various series above described, are laid down upon a ground colour which is usually white or pale yellow, but which in many specimens is relieved here and there by streaks and touches of a deeper yellow or orange. One of these streaks occupies the costa, and is plainly identical with the yellow precostal streak in *Synchloe*, *Ganoris*, and the other genera named. Although in the species of *Belenois* just referred to, as in several others, this streak is easily seen to form but one member of a series, it is nevertheless more constant and persistent than any of its companions. This is evident in those not uncommon specimens of *B. mesentina*† in which the general ground colour on the underside of the hindwing takes on so deep a yellow tinge as to approach that of the yellow streaks and touches. In these cases all or some of the latter set of markings may cease to be separately recognizable; the precostal streak, however, is always the last to disappear. In certain species of the

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* A specimen of *M. agathon* in Coll. Brit. Mus. has, however, a few orange scales in the *outer* division of the precostal space.

† *I.e.*, the form known as *B. auriginea*.

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present genus, as *B. gidica*, the ground colour remains pale; but the precostal streak is the only member of its series present. In others again, as *B. coronea*, the black spots of S exist in a state of enlargement and fusion, while the orange touches occupy nearly the whole of the spaces that are left. The light spots of series I (see p. 269) between S and M, which in *B. teutonia* are only touched with orange, are entirely of that colour in most specimens of *B. coronea*. In *B. peristhene* the amount of light ground colour is smaller still, but the orange costal streak and orange series I are present as in *B. coronea*. Both of these insects, *B. peristhene* in especial, suggest at once a comparison with certain members of the genus *Delias*, particularly *D. nysa* and *D. momea*. In these two species the yellow precostal streak and the yellow or orange series I are unmistakably present. In *D. nysa*, as in *B. peristhene*, these constitute the only relief to the general dark colour of the wing; while in *D. momea* S is partially defined by the presence of pale touches on its inner aspect in addition to the spots of series I along its outer margin.

While the species named suggest a passage in respect of this pattern of the underside of the hindwing between *Belenois* and *Delias*, there is not wanting evidence of the same import in the case of other species in which the blackening of the hindwing is a less conspicuous feature. On the underside of *D. belladonna* we cannot fail to recognize the counterpart of such a hindwing as that of *B. teutonia*; the dark and light areas occupy with slight modification the same relative positions, and the same spaces of pale ground-colour that are in *B. teutonia* touched up with deep yellow, are wholly or partially of the like colour in *D. belladonna*; among these, of course, being the precostal margin. The basal portion of the hindwing in such species as *D. eucharis* and *D. hyparete* shows a more general yellow tinge than in *D. belladonna*; but in both of these, as in other allied species, the deeper-coloured precostal streak is perfectly recognizable. In very many species of *Delias* we meet with a new feature, much of the ordinary yellow being displaced by a brilliant red; but the former colour still displays a tendency to cling to the region of the precostal space, as may be seen in *D. thisbe*; where, however, the precostal yellow hardly reaches further outwards than the pre-

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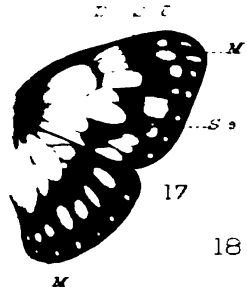
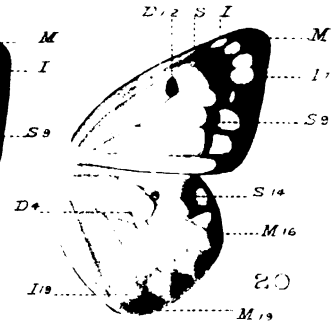


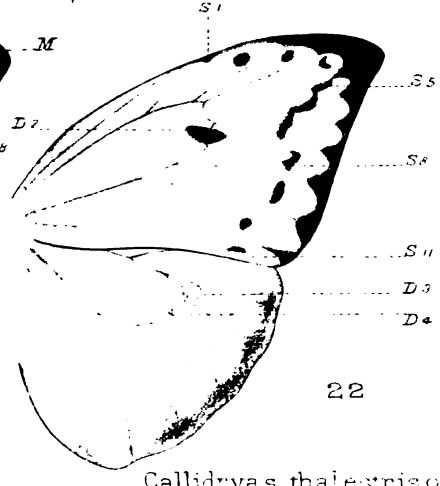
Teracolus hewitsoni

Ixias marianne ♀

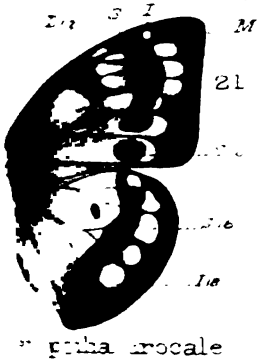


Colias hyale ♀

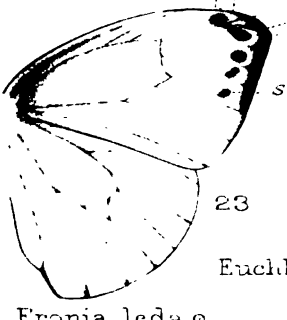
Hebomoia glaucippe ♀



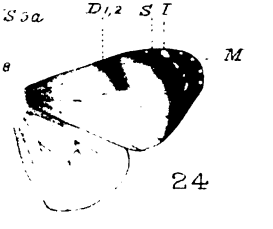
Callidryas thalestris ♀



Pieris crocale
var. flava.



Eronia leda ♀



Euchloe charlonia

West, Newman lith

Wings of Pierinæ.

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costal nervure. In the very similar *D. pasithoe* it has been driven even from this position.

Prioneris exhibits a condition very similar to that of *Delias*. The underside of *P. thestylis* closely corresponds with that of *D. belladonna*, and the resemblance applies to the precostal streak no less than to other features. In some species of *Prioneris*, as *C. clemanthe* and *P. autothisbe*, the precostal yellow is again approached, and sometimes dislodged, by a greater or less amount of bright red, as in *D. pasithoe*, *D. thisbe*, *D. crithoe*, and other members of the former genus.

Leaving the red patches and other features of the pattern of this region in *Delias* and *Prioneris* for discussion at a later stage, we may pass on to the American genera *Euterpe*, *Pereute*, *Leodonta*, and *Catasticta*. In the two last-named the arrangement of light and dark markings corresponds generally with that in *Delias* and *Belenois*, and similar touches of deep yellow are mostly present in the same relative positions. One of these, usually to be seen on the costal margin, is clearly homologous with the precostal streak in the insects already referred to; in many specimens of *C. nimbice*, *C. semiramis*, *C. toca*, and others, it bears very much the same appearance as in the old-world genera above mentioned. It may be noticed in passing that in many instances, such as *L. zenobia*, *L. dysoni*, and *C. anaitis*, the yellow precostal streak is found sharing the precostal space with a greater or smaller amount of brilliant red, as we have seen to be often the case in *Delias* and *Prioneris*. The same struggle between yellow and red is visible in the genera *Euterpe* and *Pereute*. In *E. tereas* the space is shared, the red keeping to the inner, and the yellow, when present, to the outer side of the precostal nervure. In *P. charops* the space is usually all yellow; in *P. autodice* and *P. leucodrosime* it is all red. In these two genera the other yellow marks are reduced in number or completely abolished; *P. charops*, however, generally has a conspicuous yellow patch between the costal and subcostal nervures which undoubtedly belongs to the series.

In the genus *Pieris*, which is also American, some species, such as *P. locusta* and *P. habra*, show on the under surface of the hindwing a pattern which is evidently only slightly modified from that seen in many

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species of *Catasticta*; and in these also the red or orange of the costa is a prominent feature. In other species of *Pieris* a farther alteration has taken place, and the markings have been swept from the basal portion of the wing (as in *P. demophile*), or away altogether (*P. buniæ*). In most, however, if not all of these cases, the precostal streak persists, again taking a yellow rather than red or orange colour; and, in the absence of other yellow or well-defined dark marks on the wing, it comes to resemble very closely the corresponding feature in so many species of *Synchloe* and *Ganoris*.

Summary.—The facts adduced in the course of the foregoing remarks seem so far to allow of little doubt as to the history of the yellow precostal streak. It is evidently a survival of a series of yellow or orange marks which is found, in many genera of both eastern and western Pierinæ, on the underside of the hindwing, partially or wholly occupying the paler areas left between the relics of the original dark ground colour. The greater number of these marks may disappear with a general lightening of the wing, or the whole wing may become so yellow as to render them almost or quite indistinguishable; but the particular yellow streak that occupies the margin of the precostal space is more persistent than any of the others, and may remain, as in our common species of *Ganoris*, after every other characteristic of the ancestral marking has departed. It will be seen later that this account of the precostal streak, though no doubt correct as far as it goes, in all probability needs supplementing.

b. The red basal patch.—In both British species of *Colias*, there occurs at the base of the hindwing, on the under-surface, a pinkish patch, which occupying the apices of the cell and of the median and submedian interspace, and also in most cases a small area at the root of the precostal space, is often prolonged for a short distance along the middle of the cell. This patch, which is almost always present throughout the genus *Colias*, is found in most if not all species of *Meganostoma*, and also very commonly in *Catopsilia*, *Callidryas*, *Phœbis*, *Aphrissa*, and *Metura*. It is present, too, in *Dercas*, *Gonepteryx*, *Rhodocera*, and *Amynthia*; in these, however, it does not as a rule extend far from the body itself. Beyond the limits of these closely-allied genera this

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special feature does not often occur in a very clearly-marked condition; it is, however, present in *Xanthidia nicippe*, and in several species of *Terias* and *Sphœnogona*, as *T. agave* and *S. mexicana;* it may also be seen occasionally in *Teracolus*, as in *T. antevippe*, *T. eupompe*, and (sometimes) *T. eris*, assuming in this genus a somewhat diffuse appearance. In some species of *Appias*, as *A. hombronii* (occasionally), and *A. lyncida*, as also in *Herpænia eriphia*, there are deep yellow marks near the root of the wing, which are probably homologous with part of the patch now under discussion; and in the genera *Belenois* and *Tatochila* touches of deep yellow often occur at the base of the median space, though not in the cell, which appear to correspond with the marks just referred to in *Appias* and *Herpænia* (see *B. mesentina* and *T. autodice*). These yellow touches in *Belenois* are undoubtedly members of the series spoken of on p. 279, and so far it would seem that the well-marked pink patch at the root of the cell in *Colias*, *Gonepteryx*, etc., is at least in part developed from a portion of that series, of which another member has given rise to the yellow precostal streak. It is certain, however, that other factors besides the series now indicated are chiefly, though probably not entirely, answerable for the composition of the pink basal patch in *Colias;* and it is at least possible, as will presently be seen, that the precostal streak itself owes something to their assistance. These other factors are the red basal areas to which reference has already been made, and which will now be examined in greater detail.

c. *The red basal areas.* To begin with the underside of *Delias pasithoe*, we find the base of the hind-wings occupied by a bright red patch forming about a quarter of a circle on each wing, the body itself and the immediately surrounding area of the wings being black. The spaces affected by the red patch are six; namely, the precostal, costal, subcostal (or cell), median, submedian, and internal—all those in fact whose apices reach to the base of the wing. In *D. thisbe* there occurs a similar red patch, occupying nearly the same spaces. In this insect, however, there is no red in the precostal space, which is occupied (as above noticed, p. 280) by the ordinary yellow precostal streak; while the red patch, which in this butterfly is visible on the upper as well as the underside

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of the wing, includes the apex of the space between the first and second subcostal nervules in addition to those above enumerated. *D. egialea* shows the same condition as *D. pasithoe*; but in *D. crithoe*, otherwise similar, the precostal space is black. In *D. descombesi* and *D. belisama* the red is confined to the costal interspace (*i.e.* the space between the costal and subcostal nervures); while in *D. cœneus* a submarginal set of roughly-defined red spots or dashes continues round to the anal angle the series begun by a red mark in the costal interspace, corresponding with that in the two preceding species. The submarginal series which, so to speak, becomes infected by the red coloration, is undoubtedly that spoken of above as series I (see p. 269). This latter feature of the Pierid pattern, somewhat indefinite in *D. cœneus*, becomes much more distinct in such species as *D. nigrina*, *D. harpalyce*, *D. aganippe*, *D. eucharis*, and *D. argenthona*. The latter of these has another well-marked red spot surrounding the second disco-cellular nervule, which represents a diffused reddish area in *D. duris*, and a more circumscribed patch in the same situation in *D. cœneus*. In *D. hyparete* S is going from the underside of the hindwing; in *D. hierte* it is gone; but in both cases the red spots of I remain in their full development. *D. mysis*, *D. isse*, *D. echo*, and other species exhibit the same feature in a more or less conspicuous manner.

The same red coloration is visible, as we have seen, on the underside of many species of *Prioneris* in the form of a basal patch; and in one species (*P. sita*) it spreads to the submarginal spots of series I, exactly as in *D. eucharis*. In *P. autothisbe* the red is found in the costal and subcostal interspaces; in *P. clemanthe* and *P. vollenhovii* only in the inner division of the precostal space, whence it spreads inwards upon the body.

In the American genera *Euterpe*, *Pereute*, *Leodonta*, and *Catasticta*, the red is usually present; but as in *Prioneris* and the *pasithoe* group of *Delias*, it is mostly confined to the basal portion of the wing.* In *E.*

* An exception to this rule is furnished by *Euterpe tereas* and *E. critias*, in which species the area of light ground colour immediately internal to that region of the wing which corresponds to the submarginal series S, is on both surfaces more or less deeply tinged with the same red colour as that of the basal patches. This feature is due to mimicry, the two species named

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tereas, E. critias, C. bithys, and *C. anaitis,* it most commonly occurs in the inner division of the precostal and the internal space; in *Leodonta zenobia* and *L. dysoni,* in the precostal and costal. In *L. tellane,* besides the bright red patches of the precostal and costal spaces, scales of the same colour occur in the apices of the subcostal, submedian, and internal spaces—of all, in fact, except the median. *Pereute leucodrosime* has the precostal and costal red patches; so also has *P. swainsonii*; but in *P. charops* these spaces are occupied by yellow streaks with no accompaniment of red.

Even in the genus *Dismorphia,* profoundly altered as it has been by mimicry, the same marks occur. *D. melia* has a conspicuous red spot in the inner division of the precostal space; while *D. astyocha, D. praxinoe,* and others possess a very clear representative of the same spot, with another one in the median interspace. The colour in these latter species is seldom so bright as in the first-named; it displays, in fact, a tendency to become assimilated to the chestnut tinge of other portions of the wing; the spots are nevertheless quite recognizable, and undoubtedly correspond with those in the former genera. In some species, such as *D. nemesis,* there is no red, but an indication of the yellow precostal streak is plainly visible.

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offering a very close resemblance to the females of *Papilio polymetus* and some of its allies, in bringing about which resemblance the red areas of the hindwing take a considerable share. It is interesting to observe that good as is the general effect of the imitation by these Pierines of the *Papilio* pattern, the imitative process has its limitations, and is seen on a strict examination to fail in more than one particular. Thus, (1) the Pierine is able to produce an excellent representation of the Papilionine reds and yellows, but apparently it never reproduces the metallic blues and greens, of which touches are found in the males of several of the mimicked species; (2) the costal and submedian spaces in the Pierine invariably retain their yellow patches on the underside; these are never yellow in the *Papilio*; (3) the red basal patches on the underside of the Pierine give just the same general effect as similar patches on the *Papilio*; but a close scrutiny will reveal the curious fact that the patches of the Pierine belong always to the wing, and those of the *Papilio,* in almost every instance, to the body. The wide distribution of the red basal patches among the *Pierinæ* forbids us to suppose that they were evolved for the purpose of mimicry in these few species; but it is worth noting that their presence affords material ready to hand for a sufficiently deceptive though not absolutely exact copy of a conspicuous Papilionine feature. See also note on p. 298.

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In those species of *Pieris* (such as *P. habra* and *P. locusta*) which present on the underside of the hind-wing a pattern only slightly modified from that of *Leodonta* and *Catasticta*, the red basal marks are clearly to be distinguished. A bright red patch characterises the inner division of the precostal space, and in most specimens is also prolonged into the outer division, while the apices of the median and internal spaces are likewise provided with conspicuous red touches. Comparing the underside of *P. locusta* with that of any of the American mimetic forms of *Mylothris*, we cannot well resist the conclusion that the central horizontal red or chestnut band in the latter species represents the touches of red in the median and internal spaces of *P. locusta*. The relation is best traced in the case of *M. lypera*, in which insect the part played by the yellow streak of the costal interspace in the production of the mimetic pattern is also clearly to be seen; but other species, such as *M. lorena* and *M. pyrrha*, whose mimicry of Heliconine forms is further advanced than that of *M. lypera*, still show the origin of the central red band almost equally well. In *Hesperocharis hirlanda* a somewhat similar effect is produced by slightly different means. The basal red is here confined to the precostal and internal spaces, not being found (as in *Pieris*) in the median. The horizontal red band is therefore not central but costal, its innermost extremity being constituted not (as in *Mylothris*) by the red patch of the internal space, but by that of the inner division of the precostal. The whole of the precostal red, which is absent in the three species of *Mylothris* just referred to, is prominent in *H. hirlanda*. Although these differences involve a change in the relative position of the horizontal bands of red and pale yellow in the latter species, yet the general resemblance of the underside to that of *M. pyrrha* ♂ is considerable, and is probably quite enough to tell perceptibly in the insect's favour. Other species of *Hesperocharis*, which are unaffected by mimicry, show the basal marks in the same position, but, as a rule, not very definitely, except at or near the root of the precostal space. Here there generally occurs an orange spot which partly represents the red precostal patch in *H. hirlanda* (see *H. nereis*, *H. marchalii*, and *H. anguitia*), but which in some species (as

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H. erota) can be distinctly seen to belong to the apex of the median interspace as well as to the root of the precostal.* A similiar orange spot is visible in several species of *Pieris*, such as *P. buniæ* and *P. thaloe*; and of *Leptophobia*, as *L. elodia* and *L. eleusis*. In the last-named insect again it can generally be made out that the orange spot does not belong entirely to the root of the precostal space, but is furnished with a constituent from the apex of the median interspace as well. This double character of the spot is much more evident in *L. tovaria*; and on referring once more to almost any species of *Colias*, the conviction forces itself strongly upon us that in these basal marks in *Leptophobia*, *Hesperocharis*, and *Pieris*, and so in *Euterpe*, *Leodonta*, *Catasticta*, and consequently even in *Delias* and *Prioneris*, we see represented the chief material out of which the pink basal patch in *Colias*, *Gonepteryx*, *Catopsilia*, and their allies is constructed. It is probable that, as above suggested, another element may enter into the composition of the basal patch in these genera, namely one or more members of the series of yellow streaks; a conclusion which seems to be somewhat favoured by the condition in *Belenois*, *Herpænia*, and *Appias*; but the two series are distinct enough from one another in such genera as *Catasticta* and *Leodonta*; and an unnamed species of *Hesperocharis* in the British Museum shows, still more plainly than those above mentioned, the co-existence of a relic of the basal red in the situation of the pink patch in *Colias*, with a series of yellow streaks in the interspaces like those of *Catasticta* and *Belenois*.

Summary.—With regard to the whole assemblage of red and yellow marks on the underside of the hind-wing, the following appear to be the most probable conclusions:—

The yellow precostal streak so commonly seen in butterflies of this group, including our common British species of *Ganoris*, as also the pinkish patch at the apex

* In order to avoid a possible ambiguity, I may here mention that I regard the "apices" of the interspaces as pointing towards the "base" of the wing. When a precostal nervule is present, I speak of an "outer" and "inner" division of the precostal space, the nervule forming the line of demarcation. By the "root" of the precostal space, I mean the part immediately adjoining the body.

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of the cell, of which our native species of *Colias* and *Gonepteryx* present good instances, are relics of a more elaborate system of marking seen in a high condition of development in various exotic genera. This system consists essentially of a series of red and yellow markings occupying more or less completely the pale spaces included between the radially disposed dark lines that coincide with the nervures on the one hand, and the concentrically arranged dark spots or bars of the marginal and submarginal series on the other. That this system of markings is a very primitive one is rendered probable by the fact (1) that it is represented by vestiges in so many genera of both hemispheres; and (2) that it occurs in a well-developed condition in genera so widely separated in a geographical sense as the South American *Leodonta* and *Catasticta*, and the Australian and Indian *Delias* and *Prioneris*. As a general rule, the spaces at the base of the wing tend to be occupied with red, and those on the disc and at the periphery with yellow; but in some cases, as has been seen, the red may encroach upon the submarginal yellow (as in *Delias cœneus*, *D. eucharis*, *D. argenthona*, etc.), or may be prolonged from the base in various directions across the wing (*Hesperocharis hirlanda*, *M. lypera*, *M. pyrrha*, and other American species of *Mylothris*). In the first-named genera, which exhibit the system in its full state of development, the distinction between the red and yellow markings is a perfectly easy one; but in such genera as *Pieris*, *Leptophobia*, *Hesperocharis*, *Belenois*, *Ganoris*, *Synchloe*, and *Colias*, whose markings are no doubt ultimately derived from the *Catasticta* and *Delias* pattern, it is not always easy to say to which part of the original system the relics that are present belong. On an inspection of all the forms, it would, however, seem to be the case that those members of the yellow part of the system most often persist which are capable of being reinforced, as it were, by a neighbouring red patch towards the base of the wing. For instance, the most persistent marking of all is, as we have seen, the yellow precostal streak. This is in most species of *Leodonta* and *Catasticta* closely bordered on by a bright red spot in the inner division of the precostal space; and on tracing the condition of that space from these more ancestral genera downwards, through *Pieris*, *Leptophobia*, and

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Hesperocharis, we find it become tolerably evident that the dark yellow vestige which at last alone remains is the result of a kind of convergence both in colour and position of the yellow and red markings that at first lie simply side by side and are clearly distinguishable the one from the other.* A further instance of possible convergence is supplied by the basal pinkish patch, found in the group of genera headed by *Colias*, which we have seen reason to identify with original markings of both the red and yellow kinds.† In other cases, the persistence of various members of the present system is determined by the exigencies of a mimetic pattern, as in the species of *Mylothris* and *Hesperocharis* above referred to (p. 286).

III. Phylogenetic Conclusions.

1. *The evidence of the Wing-markings.*

We are now in a position to consider as a whole the various sets of facts that have been above recounted, and to endeavour to construct, from the evidence at hand, a theory of the phylogenetic history of the entire group. This, of course, is only attempted under the

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* This, it is true, applies only or mainly to the New World forms; the similar basal red patch that partly occupies the precostal space in certain species of *Delias* and *Prioneris* not seeming to have left any traces in those Old World genera (*Belenois* and *Teracolus*), which appear to stand in much the same relation to *Delias* and *Prioneris* as *Pieris* and *Hesperocharis* do to *Leodonta* and *Catasticta*. The deep orange, however, of the precostal streak in some Old World species of *Mylothris* (as *M. chloris* and *M. agathina*), and in some species of *Belenois* (as *B. helcida*) which resemble them, may perhaps be derived wholly or in part from the precostal red; but if so, it does not bear in itself a plain record of its origin as does the like feature in the corresponding genera from America.

† Again, in *Pieris pylotis* the only marking to be seen on the under surface of the hindwing (besides the basal spot) is a short and narrow orange streak near the apex of the median interspace—an interspace that in more primitive forms, such as *P. locusta*, *Mylothris lypera*, and others, is provided with an apical red patch. It is also worthy of notice that in many species of *Belenois* the spots of series I are apt to retain or assume an unusually deep yellow or orange colouring like that of the precostal streak—this series being in some species of *Delias*, and at least one of *Prioneris*, a sharer in the bright red of the basal patches (see p. 284).

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limitations above referred to, and is not to be taken as more than a connected statement of the probable import of the facts derivable from one particular source—those facts, namely, which relate to the colours and markings. I need hardly say that I recognise to the full that any phylogenetic conclusions founded on these data must of necessity be open to checking and correction in the light of information arrived at in other ways.

The evidence that has now been examined seems to indicate that the wings in the earliest form of Pierine were uniformly overspread with a dark neutral tint.* The first variation from this condition appears to have occurred by the paling of certain areas in the principal interspaces between the nervures; a modification that may be seen in probably its simplest extant form in the remarkable American Pierine *Eucheira socialis* (Fig. 1). Here each interspace, including the discoidal cell in both wings, possesses a more or less definite pale patch, those of successive interspaces being so arranged as to form a somewhat indistinct and interrupted band crossing the disc of both wings from the costa to the inner margin. Besides this central series of pale patches, there is also a submarginal row of much smaller and fainter spots of the same greyish-white hue. The whole pattern is repeated with very little change on the under surface, but on the hindwing with even less distinctness than above. The underside of the hindwing in this insect, indeed, probably exhibits the very oldest kind of Pierine colouring to be seen in any existing species.†

The primitive system of marking manifested by *Eucheira socialis* persists with little alteration on the upper surface of many species of *Catasticta*, as, for

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* This accords generally with the opinion expressed by Mr. Wallace: "There are, in fact, many indications of a regular succession of tints in which colour development has occurred in the various groups of butterflies from an original grayish or brownish neutral tint."—"Darwinism," 2nd edition, 1889, p. 274.

† While entirely agreeing with Staudinger and Schatz that the remarkable forms *Styx infernalis* and *Pseudopontia paradoxa* are probably of great antiquity, I cannot but regard the special Pierine affinities claimed for them by these authors (and especially for the latter) as more than doubtful. See Staudinger, Schatz, and Röber, "Exotische Schmetterlinge," 1892, *sub voc.*

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instance, *C. bithys* (Fig. 2), *C. toca*, and *C. colla*. In other species of the same genus, the next steps are shown by the enlargement of the pale spots (as in *C. anaitis* ♂), their assumption of a purer white colour (as in *C. anaitis* ♀), and the confluence of those of the inner row, as in *C. trœzene* and *C. ctemene* ♂. In the latter insect the enlargement and confluence of the white patches has proceeded so far that the white must now be considered the ground colour, the original dark neutral tint being confined to the base and apices of the forewings, a narrow and interrupted marginal band on the hind-wings, and the course of the nervures with their branches (Fig. 3). In *C. corcyra*, the same process is continued almost to its furthest limit, the new ground colour has supplanted the old in every place except the apex and a narrow slip along the costa of the forewing. *C. corcyra* is thus practically a "white" butterfly; and so within the single genus *Catasticta* a complete transition is to be found, from a dark almost black ground colour, with small and indistinct pale greyish patches, to a ground colour of dead white, with hardly more than a trace remaining of the original dark surface tint. This passage from *C. bithys* to *C. corcyra* is really an epitome of the whole range of variation in pattern throughout the entire group of *Pierinæ*.

In such species of *Catasticta* as *C. semiramis*, where the pale patches are tolerably distinct, and have not yet coalesced, the dark marginal and submarginal series of spots, so characteristic of the Pierines as a whole, are visible at an early stage of their emergence. As has been shown above, on p. 267, the marginal series (called M) is formed by the remains of the dark ground colour between the outer series of primitive pale patches and the outer border of the wing; while the submarginal series S comes into view between the outer and inner series of pale patches. Besides these, a relic of the dark ground colour is seen to remain about the disco-cellular nervules in the forewing, which forms the first beginning of a definite discoidal spot; and another row of minute pale patches, each occupying the centre of an interspace on the extreme outer margin of the wing, begins to split up the marginal series in the manner already spoken of. The definite character of series M is assumed sooner on the forewing than on the

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hindwing, and in the latter situation the discoidal spot has at this stage scarcely become recognizable; in some species, however, a patch of pale-coloured scales covers the lower disco-cellular nervule of the hindwing in the midst of a wide and not sharply-defined area of dark ground colour.

So far little or no essential difference has been noted from the primitive pattern of *Eucheira socialis*; the variations produced having simply resulted from a greater or less extension of the intrusive pale tint along the lines originally marked out. But, on turning to the underside of any species of *Catasticta*, we find what at first sight appears to be a very considerable divergence. A careful examination, however, soon makes it plain that the pattern of the lower surface is throughout the genus essentially the same as that of the upper surface, though one or two new features are superadded. Confining our attention in the first place to the forewing, for instance in *C. nimbice*, we find the submarginal series S and the discoidal spot shown at least as clearly as on the upper side; while from the greater prominence of the pale spots at the extreme margin, M is brought still more plainly into view below than it is above. On the hindwing, the central pale band may be easily traced across the disc of the wing, leaving on the one side of it a basal, and on the other a broad marginal dark area. Traversing the latter can be seen a row of elongated, more or less wedge-shaped, yellow streaks, which represent the more easily recognized series I of the forewing; while a distinct row of yellow spots on the extreme margin continues the similar series from above. Though S and M are not yet sharply marked off from one another, the portions of dark ground colour to which they respectively belong are already separately recognizable. The undersides of *C. nimbice*, *C. colla*, *C. toca*, and *C. corcyra* will be found to make a very good transitional series, showing the gradual emergence of S and M and the subsequent reduction of each to a mere festooned line.* The superadded features above alluded

* An unnamed species of *Catasticta* in the British Museum presents a condition of the underside of the hindwing more exactly intermediate between *C. corcyra* and the usual type than any of the species mentioned. An individual of the same species is in

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to are (1) the streaks and touches of yellow that begin to occupy much of the area of the original pale patches, including, as has been seen, the spots of I on the hindwing; and (2) the bright red patches visible in the basal region of the same wing close to the body. These have been already discussed at some length (see pp. 281, 285), and their importance has been shown in reference to the markings of more recent groups. In this place it is only necessary to note once more that their ancestral character seems to be proved not merely by their existence in a fully developed condition in genera so widely separated geographically as the Western *Catasticta* and *Leodonta* and the Eastern *Prioneris* and *Delias*, but also by the fact that there is scarcely a genus throughout the whole sub-family, whether in the Old or New World, that does not show some relic of their former presence. With regard to their origin, no clue appears now to exist. It seems impossible to trace them further back than to the Eastern and Western genera named; and the probably still more primitive form, *Eucheira socialis*, to which we should naturally turn for an indication of their development, affords us in this particular no information whatever.

In the genus *Leodonta* we find some modification in the shape of the wings, and only three instead of four branches to the subcostal nervure of the primaries. But the wing pattern remains much the same as in those species of *Catasticta* where the white central band has grown into a well-defined area and the two series S and M have not yet become clearly distinguishable. The yellow streaks and red basal marks are still prominent on the hindwing beneath, and the separation between S and M is, in this genus also, more evident on the underside.

In *Pereute* and *Euterpe*, which are undoubtedly very close allies of the genera just referred to, the development of the pattern has taken a somewhat different direction. The primitive dark ground colour is in the males of several species of *Pereute*, as *P. charops*, *P. autodyca*, and

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the Hewitson collection labelled as *C. notha*. This is undoubtedly erroneous, as the underside of the true *C. notha* is almost exactly like that of *C. corcyra*.

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P. swainsonii, relieved by dustings of pale pinkish or bluish grey, which do not seem to bear any particular relation to the lighter patches in *Catasticta* or *Eucheira*. These greyish areas are often, especially in the females (including those of the species named), brightened up into bars or broader expanses of vivid red (*P. leucodrosime*) or blue (*P. telthusa*), and the aspect thus produced is very unlike that of nearly all the members of the allied genera. But as has been shown above, at pp. 281 and 285, an indication of affinity in coloration with those genera is preserved in the red and yellow patches of the underside of the hindwing; and, what is very remarkable indeed, there are two species of *Catasticta*, namely *C. teutamis* and *C. ctemene*, the males of which are of the usual *Catasticta* type, while the females present, together with the ordinary *Catasticta* neuration and structure, the aspect characteristic of *P. charops* ♀ and other highly coloured members of the genus *Pereute*. In the case of these two *Catastictas* there can, I think, be no doubt that it is the male rather than the female that represents the ancestral colouring of the group, and we are thus led to the conclusion that some common cause has brought about the divergence in the same direction of these female *Catastictas* and both male and female *Pereutes* from the ordinary character of their nearest relatives. This cause I believe to be mimicry, the models for which in the present instance are to be found in certain species of *Heliconius*, particularly *H. melpomene*, *H. phyllis*, and their allies.* The resemblance is not perfect,† but in all probability is quite sufficient to be of much service to the Pierine mimics; and we find exemplified here, as in many other cases, the much greater readiness with which the female assumes the protective coloration. As we

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* I also think it exceedingly likely that *Papilio euterpinus*, Godm. & Salv. (Ecuador), forms one of this mimetic group. It is, however, remarkable that its range seems not to coincide with that of the Pierine, namely *P. charops* ♀, which probably resembles it most closely in size as well as colour.

† The red colour of the species of *Heliconius* here mentioned (to which may be added *H. vulcanus* and *H. hydara*), as they occur in collections, is by no means so vivid as that of their supposed imitators. But Mr. A. G. Butler and Mr. F. A. Heron both inform me that the red in *Heliconii* has a special tendency to lose its brightness, even in specimens carefully preserved in the dark.

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have seen, the male *Catasticta*s are not affected at all; while in most species of *Pereute* the males have not advanced nearly so far along the mimetic path as have the females. Another point worthy of observation, which is paralleled elsewhere, is the fact that the males show a much closer approach to the complete mimetic pattern on the lower than on the upper surface.*

A similar explanation will apply to the even more remarkable divergence shown by the genus *Euterpe*, though here the phenomena are so curious and complex as to require a more detailed treatment. This genus (as restricted by Butler, Cist. Entom. i., pp. 34, 42) does not contain a single form that reproduces in general aspect the typical Pierine features; every species indeed is the subject of a mimetic change, and such marks of their origin and relationships as they retain, are used up in a more or less modified condition to help in the production of the deceptive pattern. Thus we have seen how in *Euterpe critias*, *E. tereas*, *E. rosacea*, and allied species, the area representing the white central band on the hind-wing, now tinged with rosy pink, has become an important ingredient in the general imitation of *Papilio zacynthus* ♀; the red basal patches on the under surface also taking their part in the picture. There is, moreover, little doubt that the white spot on the forewings is identical in origin with the usual white central bar, while for the marginal yellow spots a counterpart is easily found in *Catasticta nimbice* and many of its allies. In *Euterpe bellona* we find the patch on the forewings bright yellow instead of white, while the rosy patch is intensified in colour and split up into three or four brilliant streaks radiating from the base towards the margin of the wing. The general effect is not very dissimilar from that of *E. critias*, and the identity of the markings is beyond question; nevertheless the changes, slight as they are, are highly significant, for they import nothing less than the substitution of a member of the Heliconine for one of the Papilionine group as a model for imitation. *Euterpe bellona* undoubtedly mimics the Heliconine group of which *H. thelxiope* and *H. burneyi* are conspicuous members; and it would be difficult to find a better instance to show how slight a

* See Weismann, "Studies," vol. i., pp. 7, 8 (English Edition).

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modification of an existing pattern may suffice to produce an effective copy of an entirely different insect. Facts of this kind seem to go a long way towards answering such objections to the theory of mimicry as those alluded to by Mr. Beddard in his "Animal Coloration," 1892, pp. 214, 215.

It is very remarkable that red basal patches, like those of the mimicking Pierines, occur on the underside of the hindwing in most, if not all, of the Heliconii and Papilioninæ mimicked by members of the genera *Pereute* and *Euterpe*; and in some, *e.g.*, *H. melpomene*, there is even a well-defined yellow precostal streak. Now although there is no difficulty in ascribing most of the features in the coloration of these Pierine genera to the operation of mimicry, it would seem, for the reasons given above (p. 285, note), that the origin of these particular marks, which are so wide-spread and so persistent throughout the whole Pierine subfamily, must be excepted. Nor, in the absence of any evidence of a direct causal relation, does it seem to my mind more satisfactory to consider the occurrence of these patches in the three diverse groups, Papilionines, Heliconines, and Pierines, as the effect of similar external conditions. If we assert them to be purely "accidental," we are met by the fact that although they are found in some species of both *Papilio* and *Heliconius* that are apparently not the subject of mimicry, yet they are most distinct and most prevalent in those species that are copied by Pierine imitators; and the same considerations (amongst others) seem to show that the supposition that they are simply due to inheritance from a common ancestor of all the groups must be inadequate. Before the phenomenon is dismissed as inexplicable, it may be worth while to consider the following suggestion.

According to the well-known principle laid down by Fritz Müller and expanded by Meldola, by which these authors have been enabled to account for cases of parallel resemblance between the species of protected genera, and also of the grouping of allied inedible species into distinct sets, each with its own scheme of coloration,* it

* F. Müller in "Kosmos," 1879, p. 100; Meldola in "Proc. Ent. Soc. Lond.," 1879, p. xx., and "Ann. and Mag. Nat. Hist.," Dec., 1882. See also Wallace, "Darwinism," 2nd ed., 1889, pp. 249–257, and Poulton, "Colours of Animals," 1890, pp. 192–195.

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is advantageous for any two or more protected species to join their forces, in order to share the toll levied upon them by inexperienced enemies. In such cases it no doubt often happens that one species serves as the standard to which the others conform, whether by way of convergence or of arrested divergence; but there seems no reason why, especially if there is no conspicuous inequality of numbers, there should not be a kind of "give and take" arrangement between mimicker and mimicked, the latter advancing some way to meet the former for their mutual benefit. In other words, when two species, A and B, form an association of this kind, it need not be supposed that the form of A remains fixed, while B assimilates itself to it, or *vice versa*; but the association may really be formed by both A and B converging towards a point between them, or, in short, mimicking each other. The acceleration of the process which in many cases would result, must of itself be an advantage. Now if the grouping of kindred inedible forms in associations of this kind is beneficial, it would seem that the benefit might extend to members of families far removed from one another, like the three now under discussion, as well as of the same family or genus;* the only requisites being (1) that all should be more or less inedible, and (2) that all should have patterns capable of assimilation to one another. Nor does there seem to be any reason why a *mutual* convergence of the kind indicated should not take place under these conditions also. With respect to (1), it has, I think, nearly always been assumed that the *Pierinæ* which resemble the members of other families are edible; and this is no doubt the case with the numerous members of the genus *Dismorphia* † (*Leptalis* of Dalman), which were among the first to attract notice to the subject of Mimicry in general. But no direct proof seems to exist that the species of *Euterpe* and *Pereute* now under discussion are edible; and indeed Mr. Wallace considers (Trans. Ent. Soc. Lond., 3rd series, iv., pp. 309, 310; Darwinism, 2nd ed., 1889,

* Such an association is already well known to occur between *Heliconidæ* and *Danaidæ*.

† This, however, has been questioned by Mr. Beddard, who cites some observations of Scudder as tending to show the contrary. See "Animal Coloration," 1892, p. 215.

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p. 244) that the genus *Delias* (*Thyca* of Wallengren), which is probably nearly related to *Euterpe* and *Pereute*, possesses a disagreeable flavour, or some other special means of protection. If this is shared by its American relatives, the first of the above requirements would be satisfied, while the second (2) has been shown to be met, in the special instance of the red basal patches, by the occasional presence of somewhat similar spots or patches (whose origin is not now under discussion) in other species of both the Papilionine and Heliconine groups, which afford quite sufficient material for the assimilative process to work upon. Until, therefore, direct proof is forthcoming of the edible qualities of the Pierines in question, it will not be unreasonable to suppose that they have joined an "inedible association," and to attribute this curious agreement in a detail of pattern between members of such diverse groups to the operation of what may perhaps be called "reciprocal mimicry."* The Pierines have no doubt moved furthest from their original form, having in most respects clothed themselves in Papilionine and Heliconine colours, but the latter have themselves advanced some way to meet the Pierines, in adopting from them a more distinct and characteristic employment of the red basal patches.†

* This, it will be seen, is distinct from "convergence" in the usual sense, inasmuch as that term has hitherto been employed (as by Poulton, "Colours of Animals," 1890, p. 195) to signify the assimilation of one form to another, rather than the mutual approach by two forms to a mean between them.

† Fritz Müller notes ("Kosmos," 1879, p. 100, and translation by Meldola, Proc. Ent. Soc. Lond., 1879, p. xxiv.) that "in the province of Santa Catharina, *Euterpe tereas* is common in the forest-paths almost throughout the entire year, while its model, *Papilio nephalion*, is, on the other hand, a rare butterfly." This is so far in favour of the supposition that the resemblance is not due to mimicry by the Pierine, at least in the strict sense.

There is one more piece of evidence that seems to favour the conclusion arrived at above. So far as I am aware no explanation has yet been offered of the fact that it is the females and not the males of *Papilio polymetus*, *P. zacynthus*, etc., that are resembled by *Euterpe tereas* and *E. critias*; whereas the males, which display brighter colours, afford at least as good if not better models for imitation. I would suggest that this is really due to "reciprocal mimicry." The protection gained by the resemblance between the Pierines and Papilios is not all on the side of the Pierines, but mutual; and the female Papilios have, as is usual, felt the need of it more urgently than the males. For this reason the female

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Euterpe theano and *E. eurytele* present us with another kind of departure from the ordinary Pierine condition, the latter being an excellent copy of *Lycorea atergatis* and *Ceratinia* (*Ithomia*) *dionæa*; while *E. theano* exhibits the form of *E. eurytele* with a coloration much like that of *Pereute charops* ♂.

We find then that, thus far back in the growth of the Pierine stock, a large section has been diverted under the influence of mimicry from the regular course of development of the Pierine pattern; and in order to continue the history of the latter, we must retrace our steps and take up the thread where we left it before beginning to discuss the mimetic forms of *Pereute* and *Euterpe*.

Although it does not appear that the Old World can show any truly Pierine form so ancient as *Eucheira socialis*, there does exist a genus which seems to represent in the East nearly the same stage of development as *Catasticta*, *Leodonta*, *Pereute*, and *Euterpe* in the West. This is the genus *Delias*, the close relationship of which with the western forms mentioned has been indicated by Doubleday and Westwood (Genera of Diurnal Lepidoptera, vol. i., p. 33), and more distinctly suggested by Wallace (Trans. Ent. Soc. Lond., 3rd series, iv., p. 344).* The pattern of *Delias belladonna* is essentially similar to that of the early *Catastictas*, consisting as it does of a dark ground-colour relieved by paler touches in the interspaces, between which touches the ground-colour is already beginning to show a rudimentary division into a marginal and submarginal chain with a vaguely indicated discoidal patch in each wing. On the underside we have the same pattern in a slightly more distinct form; while, as in *Catasticta*, the pale areas of the hindwing and the apical region of the forewing are furnished with yellow streaks. The red basal patches, so characteristic of

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Papilios have been led to meet the Pierines by discarding, or at any rate by not adopting, the bright metallic blues and greens that ornament the other sex. This was no doubt a shorter and easier way to the formation of an "inedible association," than would have been the acquisition by the Pierines of colours more nearly resembling those of the male Papilios.

* *Delias* agrees closely in neuration with *Pereute* and *Leodonta*. See Butler, Cist. Entom., i., p. 40. Staudinger and Schatz, "Exot. Schmetterl.," 1892, Theil. ii., p. 63.

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Catasticta and its allies, are not represented in *D. belladonna*, but in all the members of the *pasithoe* group they are not only present, but have become a very conspicuous feature in the coloration. It is not difficult to bring the other markings of *D. pasithoe*, *D. thisbe* and their allies into relation with those of *D. belladonna*, though the dark series S and M are as a rule less clearly indicated. The *pasithoe* and *belladonna* groups of *Delias* may thus be considered as on the whole the most ancient.* In the well-known *D. eucharis* we have the series S and M complete; the female, as is usual, showing less departure than the male from the more generalised form. As in *Catasticta*, no sooner have the dark series emerged into distinct existence than they begin to disappear; they are much less recognizable in *D. hyparete* and *D. agostina* than in *D. eucharis*, and in *D. hierte* they reach the vanishing point. *D. eucharis* and its immediate allies follow the early condition of *Delias* in having the interspaces on the underside of the hindwing more or less filled in with yellow, but they depart from it in having lost the red basal patches, and in possessing a conspicuous submarginal band of red spots (series I) between the dark series S and M; these are best seen in *D. eucharis* itself. An early stage of this red series is probably present in *D. cœneus* and the closely allied *D. philotis*, which seem to be linked with the still more primitive butterflies of the *pasithoe* group through such forms as *D. belisama* and *D. descombesi* (see p. 284). Regarding then *D. cœneus* as a new starting-point, we may trace from it in one direction the Indian group headed by *D. eucharis*, and in another the Australian forms *D. aganippe*, *D. harpalyce*, and *D. nigrina*. It is to be observed that both *D. eucharis* and *D. aganippe*, though probably more recent than *D. cœneus* so far as regards the underside of the hindwing, nevertheless retain in other respects more of the primitive pattern; from which we may probably conclude that some form now lost, rather than *D. cœneus* itself, supplies the true link with the *belisama* and *pasithoe* groups, while *D. cœneus* and *D. philotis* survive to show how "series I" acquired in

* I follow, in nearly every particular, Mr. Wallace's division of this genus into groups. See Trans. Ent. Soc. Lond., 3rd series, iv., p. 344, etc.

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the *eucharis* and *aganippe* forms its conspicuous character. I have little doubt that the curious form *D. aganippe* is one of the oldest existing species of *Delias* in the Australian region, inferring this from its retention of the primitive series S and M with the discoidal patch in the forewing in fairly distinct form, from the presence of yellow streaks in the interspaces of the under surface, and from the occurrence of a basal red spot in the precostal space of the underside of the hindwing. Many of these points assimilate it to the *pasithoe* group, and even more closely to *D. belladonna*.* *D. harpalyce* and *D. nigrina* seem to follow naturally on from *D. aganippe*, though in respect of the *costal* red they are perhaps a little nearer the still more primitive *D. belisama*. Another Australian offshoot of the *D. cœneus* stock is probably represented by *D. argenthona*, *D. mysis*, *D. isse*, and *D. dorimene*. The Indo-Malayan and Australian *nysa* group is probably derived from the *pasithoe* and *belladonna* groups through *D. orphne* and *D. momea*. It would be most interesting to attempt to trace in detail the phylogenetic history of the whole of this extensive genus, but it must here suffice to have indicated what appear to be the principal lines of derivation. Two points of analogy with the kindred neotropical genera may be noted before we pass on. The first is that although the invasion of a paler tint does in *Delias* tend to split the original ground-colour into marginal and submarginal series quite similar to those of *Catasticta*, and though these series in various stages of development and suppression, as also in *Catasticta*, meet us here and there throughout the entire genus, yet in many cases the series never emerge in any recognizable form, and there seems in several species a tendency for the white invasion to begin near the bases of the wings, and simply sweep the dark ground-colour away towards the margins. Even in these cases, however (as in *D. belisama* and *D. descombesi*), the females, on the underside, will usually show some indication of the primitive series. The second point to be noted is the way in which the resources of Pierine coloration are taxed to give the insects of this genus a brilliant appearance. As in the case of some of their neotropical congeners, this is effected not so much

* See Wallace in Trans. Ent. Soc. Lond., 3rd series, iv., p. 349.

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by the importation of any new feature as by the brightening up and extension of features already present, and indeed often common to the whole subfamily. The reason for this ornamentation is doubtless the same in both cases—namely, to call attention to inedible qualities. The Eastern genus, however, seems to have itself become a model for mimicry (Wallace in Trans. Ent. Soc. Lond., 3rd series, iv., pp. 309, 344), while the Western genera have modified their ancestral form in order to join an alien company of inedible insects.

The genus *Prioneris*, though differing slightly from *Delias* in neuration and other structural characters, is probably nearly akin to it, and represents, so far as the colouring is concerned, a similar degree of antiquity in the Pierine stock. The close resemblance of pattern between different species of *Delias* and *Prioneris*, to which reference has already been made (pp. 258, 284, etc.), is no doubt a true case of mimicry, but represents probably the result rather of arrested divergence than of the acquisition by *Prioneris* of new imitative features.

The two groups that have just been discussed, namely, those formed by *Delias* and *Prioneris* in the Old World, and by *Catasticta*, *Leodonta*, *Euterpe*, and *Pereute* in the New, thus constitute together a second grade, as it were, in Pierine development. The only earlier species yet mentioned is *Eucheira socialis*, but there exist certain other forms which appear to be but little inferior to that insect in antiquity; and to these, with *Eucheira*, the name of "Pierines of the first grade" may be applied. One of the forms now referred to is *Metaporia agathon*. This remarkable insect is probably the representative of an ancient group of Pierines, among which were to be found the common ancestors of the two second-grade assemblages already mentioned, and which, no doubt, supplied the link at present wanting between *Eucheira* and *Catasticta*. The relation of *Metaporia* with the Eastern assemblage is more direct than with the Western, for although it offers points of structural difference from *Delias*, it shows, nevertheless, a condition of the primitive Pierine pattern which is in all essentials identical with that of the earlier kinds of that genus. The correspondence of its markings on the upper surface with those of *Delias belladonna* and *D. eucharis* is at once evident, and, like *D. belladonna*, it has a patch of bright

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yellow in the precostal space on the under surface of the lower wings. This, however, is usually confined to the inner division of the space.* Mr. Wallace† considers that *Metaporia agathon* forms with *Pontia nabellica* the fragments of an extensive natural group. He also points out the readiness with which the pattern of *M. agathon* can be traced through *P. nabellica*, *P. soracta*, and *P. hippia*, to its final disappearance in *P. cratægi*. In this range of species, to which may be added *P. oberthüri*, *P. leucodice*, *P. belucha*, and others, we recognise the now familiar phenomena of the emergence, establishment, and evanescence of a marginal and submarginal series of spots, together with a discoidal patch, formed out of relics of an original dark ground-colour. Another primitive Pierine feature, namely the persistence of dark ground-colour along the course of the nervures and nervules, is found throughout the group; and in *P. cratægi* survives the disappearance of almost every other indication of the original coloration.

The line thus marked out ends with *P. cratægi*; but in another direction there is little difficulty in linking *Pontia* with *Eucheira*, and so demonstrating the intimate connection with one another of the three last-named genera. Thus *Pontia* recalls *Eucheira* by the outline of its wings, especially the concave costal margin,‡ and in pattern *P. nabellica* shows no very great departure from the same genus. But a more striking sign of affinity exists in the common larval habitation, which, though merely rudimentary in *P. cratægi*, and belonging only to the early larval stages, is no doubt a degenerate or undeveloped form of the elaborate silken nest constructed by *E. socialis*. Webs of a structure apparently comparable with the latter are made by *Neophasia terlootii* and an allied species mentioned (though not described) by Behr.§ The affinity of the two latter insects with the genus *Pontia* appears certain; and though Behr is perhaps wrong in making them con-

* One specimen of *M. agathon* in Coll. Brit. Mus. has a few orange scales in the *outer* division of the precostal space as well.

† Trans. Ent. Soc. Lond., 3rd series, iv., p. 313.

‡ Noticed by Staudinger and Schatz, who compare it to that of *Parnassius*, Exot. Schmetterl., Th. ii., p. 62.

§ Trans. Amer. Ent. Soc., 1869, p. 303; Proc. Calif. Acad. Sci., second series, vol. ii., 1890, p. 91.

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generic with *E. socialis* (which he does not seem to have seen.),* his description, nevertheless, renders it extremely probable that they are more closely related to that species than any other known butterfly. The Pierines of the first grade may accordingly be said to consist of *Eucheira*, with Behr's two "*Neophasias*," *Pontia* and *Metaporia*. The prevalent larval habit of spinning is no doubt an indication of the high antiquity of the group, and suggests, as do other features, a relationship with the Parnassids. This suggestion is further borne out by the aspect of *Mesapia peloria*, which is no doubt an offshoot of the genus *Pontia*. But such relationship is certainly of no close or direct kind, and is probably only referable to an extremely remote ancestor of the two subfamilies.†

Leaving the genus *Pontia* for a time, we may make a fresh start with *Metaporia agathon*, from which point it is not difficult to trace another principal stem, with numerous and important ramifications. The females of several species of Mr. Moore's genus *Huphina*, for instance *H. phryne* ♀, show what is to all intents and purposes the same pattern as *M. agathon* (Figs. 7, 8); and the males differ only or chiefly by the more ready admission of the white invasion, at the expense of the remains of dark ground-colour. The pattern of such a form as *H. nama* ♀, seems at first sight to belong to a different category, but a very good transition from that of *M. agathon* is afforded by *H. eperia* ♀, which shows how the arrangement of white patches in *H. nama* ♀ has grown out of the discal and cellular white, while the more marginal series I sinks gradually into the background, and with its disappearance the two dark series S and M lose of course their distinctive character. In one ancestral point, namely the filling up to a greater or less extent of the interspaces of the hindwing underside with yellow, *Huphina* shows a closer resemblance to *Delias* and *Prioneris* than to *M. agathon*, in which insect this feature is only slightly indicated. In many species

* *N. menapia*, included by Behr in the same genus, differs from *Eucheira* is neuration and other points.

† *Davidina armandi* has been spoken of as a transitional form. But, as remarked by Staudinger and Schatz (*op. cit.*, Th. ii., p. 57), it is shown by Oberthür's figure (Etudes, iv., pl. ii, fig. 1) to be without any of the points characteristic of the Papilionidæ.

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of *Huphina* the yellow is very vivid, in some it is warmed into a rich orange, and it not infrequently, as in *H. naomi*, *H. lea*, and *H. judith*, appears on the upper surface as well.

From the pattern of *Huphina* to that of *Catophaga* the passage is easy through such species as *H. cassida*, *H. nabis*, *C. paulina* (Fig. 9), and *C. ega*. In the latter genus, as in the former, the dark ground-colour is retained in much larger measure by the females than by the males; the latter indeed (as in most specimens of *C. galena* ♂) have often lost it altogether. Other marks of specialization shown by the male *Catophagas* are the sharply-pointed shape of the wings, and, above all, the presence of a tuft of long hairs springing from the base of each of the anal valves. All these characters belong equally to the next genus *Appias* (which indeed is not easily to be distinguished from *Catophaga*), though here the specialization of the males has in many forms been carried to a much greater extent, and is occasionally in some respects shared by the females, as in *A. nero*. In this insect the female shows the remains of the usual dark marginal and submarginal series standing out upon a ground colour of rich red almost as brilliant as that of the male, and altogether different from the ordinary Pierine white or yellow. The females, however, of *A. celestina*, *A. clementina* (Fig. 10), and others, do not depart, like the males, from the ordinary facies of the group, * and are indeed, barely distinguishable from the females of *C. jacquinotii*, *C. alope*, and other species of *Catophaga*. The assemblage of species united by Mr. Distant as *Saletara* (including *S. panda*, *S. cycinna*, etc.) is undoubtedly an offshoot from the *celestina* group of *Appias*.

In the three last-mentioned genera, although the two series S and M are generally more or less traceable, and although in most cases a decided remnant of ancestral black persists along the costa of the forewing, there is as a rule no relic of the original ground-colour in the region of the disco-cellular nervules; that is to say, there is no discoidal spot or patch. In *Hiposcritia*, however, which is apparently an early and purely Indian offshoot of *Catophaga*, some species (as *H. pandione*) exhibit an incipient discoidal patch, still in connection with

* See Wallace, Trans. Ent. Soc. Lond., 3rd series, iv., p. 301.

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the dark-coloured costa; in others (as *H. lalage*) this has become a distinct discoidal spot (Fig. 11). *Hiposcritia*, by its anal tufts, belongs decidedly to the *Catophaga* and *Appias* group; but the shape of its wings and the occasional persistence of dark ground-colour about the discocellular nervules indicate that its origin is to be placed somewhat far back towards *Huphina* and *Metaporia*.

Starting again from *Metaporia* and *Pontia*, we find in the small Siberian *P. leucodice* an unmistakable link between these genera and *Synchloe*. In *S. callidice*, which perhaps come nearest to *Pontia*, the female shows S and M in a well-defined condition, together with a large distinct discoidal patch; the nervures and nervules are also in many instances clothed with black scales. From *S. callidice* we can advance in one direction through *S. chloridice* to *S. glauconome*, *S. johnstonii*, and *S. hellica*; while *S. daplidice* and its immediate allies form another slightly divergent branch from *S. chloridice*. *S. callidice* again in all probability marks the point at or near which the assemblage of species grouped as *Ganoris* leave the main *Synchloe* stem; *G. napi* being no doubt the species which is closest to the original stock, as is shown by the large persistence of S and M, the tendency towards blackening of the nervures, the occasional indication of a discoidal spot, and the peculiar coloration of the underside of the hindwings. It is noticeable that *Ganoris* generally, including *G. napi*, retains the precostal yellow streak, which, though present in most species of *Synchloe*, happens to be absent in *S. callidice*.

Most species of the genus *Tatochila* strongly resemble *Pontia* in pattern (the resemblance between *Tatochila* and *P. leucodice* has been pointed out by Mr. Butler, Proc. Zool. Soc., 1872, p. 62), while *T. autodice* ♀ comes nearer to *M. agathon* than does any species of *Synchloe*. The whole neuration of *Tatochila* is very similar to that of *Pontia*; and even the peculiar arching of the 1st subcostal of the hindwing (well seen in *P. cratægi*) is a noticeable feature in *T. theodice* and other members of the same genus.* *Tatochila* may, therefore, be considered to be a derivative from the *Pontia* stem at a point somewhat further back than the existing species of *Synchloe*.

* See Mr. Butler's figures in Ann. Mus., vol. i., pl. iii., figs. 7 and 9.

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A comparison of *Tatochila* (especially of *T. theodice*) with *Phulia nymphula* will show an almost exact identity of pattern, the correspondence extending even to the chevron-shaped spots of S in the hindwing, and to the peculiar triple striation of the nervules on the under surface. The neuration of *Phulia* is distinct, but not really far removed from that of *Tatochila*, some species of which show a near approach to its most remarkable feature; viz., the emission of the second radial from the subcostal, and the consequent obliteration of the upper disco-cellular. *Phulia* again is closely allied in structure with Mr. Moore's genus *Baltia*,* which, however, retains the short 3rd subcostal nervule lost by *Phulia* and several species of *Synchloe*. *Phulia* and *Baltia* are thus, in all probability, the terminal twigs of another branch which issued from the *Pontia* stem between the departure of *Tatochila* and *Synchloe*. *Neophasia menapia* appears to me to be an offshoot of the same stem at an earlier stage than *Tatochila*. It may possibly belong to the *Eucheira* group, but it is not known to make a social web,† and Behr gives no real grounds for making it congeneric with "*N.*" *terlootii*. As above noted, its neuration is very distinct from that of *Eucheira*.

The African species of the genus *Mylothris*‡ appear to hold a somewhat isolated position. Their neuration shows points of likeness with the equally isolated Australian genus *Elodina* and the widely-spread and probably ancient *Nychitona*, ‖ which genera they also somewhat resemble in texture of wing. In pattern they are chiefly remarkable for the strong and distinct development of series M, and of the precostal orange-red

* Moore's type is "*Mesapia*" *shawii* of Bates, which is certainly generically distinct from *M. peloria*, and much nearer *Synchloe*. The butterfly described by Moore in Proc. Zool. Soc., 1882, p. 234, as *Synchloe butleri* is undoubtedly a *Baltia*.

† Stretch, however (Papilio, ii, pp. 106, 107), describes the larvæ of *N. menapia* as suspending themselves from great heights at the end of long silken threads. Even the pupæ were, in some cases, suspended. It is probable that the numerous threads covering the bark of the trees seen by Stretch (*ibid.*), were also made by these larvæ.

‡ I cannot but agree with Mr. Trimen (South African Butterflies, 1887, vol. iii., p. 29) that the American *P. pyrrha*, Fabr., and allies, are not generically akin to the African *M. agathina*, *M. chloris*, etc., with which Mr. Butler unites them on account of their correspondence in neuration (Proc. Zool. Soc., 1892, pp. 37, 38).

‖ Distant, Rhopalocera Malayana, 1882—1886, p. 287.

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on the underside of the hindwing. We may, perhaps, regard all three genera as relics of an ancient fauna of the Eastern Hemisphere coeval with the earliest forms represented by the present *Delias* stock, and anterior to the various branches which have diverged from that genus or from *Metaporia*. The precostal orange suggests a kinship with *Delias* on the part of *Mylothris*, though no such link exists in the case of the other two genera, and, as pointed out by Mr. Trimen, who considers *Mylothris* and *Thyca* (*Delias*) to be allied genera, the former genus, like the latter, undoubtedly contains subjects of mimicry by *Pierinæ* of other groups. Thus, "The imitation of *M. agathina* by *P. thysa*, Hopff., is deceptively close in both sexes, and *M. poppæa*, Cram., is similarly copied by *P. rhodope*, Fabr., on the West Coast. *M. agathina* is also mimicked by the female *Eronia argia*, Fabr."*

We now have to deal with the genus *Belenois*, which presents some special difficulties. In the first place, we find an assemblage of species (*B. lasti*, *B. nagare*, *B. majungana*, and *B. isokari*) from East Africa and Madagascar, with respect to which Messrs. Grose Smith and Kirby, after noting that they are now placed with *Phrissura* in the Collection of the British Museum, go on to observe that they "differ entirely in neuration from the types of *Phrissura*, agreeing in this particular with *Belenois*, in which genus we prefer to include them."† The type of Mr. Butler's *Phrissura* is apparently *P. illana*, Feld.,‡ and in 1872 (Proc. Zool. Soc., 1872, p. 51) the only other species of *Phrissura* admitted by Mr. Butler was *P. polisma*, which is undoubtedly a very near relative of *P. illana*. Both of these species offer differences in neuration from *B. lasti* and its allies.‖ Now,

* South African Butterflies, vol. iii., p. 39 (1887).

† Rhopalocera Exotica, Oct. 1892.

‡ Mr. Butler first gave it as *P. cynis* (Cist. Entom., iii., 1870, p. 49), but afterwards corrected it to *P. illana* (Trans. Ent. Soc. Lond., 1871, p. 171). Mr. Distant has since made *cynis* the type of his new genus *Udaiana*. (Rhopal. Malayan., 1882—1886, p. 286 and note).

‖ In *P. illana* (forewing) the discoidal cell is unusually short, the second subcostal starts from the end of the cell, and the second and third median nervules come off near together; in *B. lasti* the cell is of the ordinary length, the second subcostal is emitted before the end of the cell, and the second and third median nervules do not start particularly near together.

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however, certain forms are included under *Phrissura* in the Collection of the British Museum (*P. phaola, P. sylvia, P. eudoxia,* etc.) which appear to me to agree in structural characters with *B. lasti,* and to differ from *P. illana.* If, therefore, Messrs.. Grose Smith and Kirby are right (which I do not doubt) in separating *B. lasti,* etc., from *Phrissura* as represented by *P. illana,* I am strongly of opinion that *P. phaola, P. sylvia, P. eudoxia,** and *P. coniata* should go with them; and to this assemblage I would add every so-called *Belenois* that is furnished with anal tufts, together with "*Belenois*" or "*Glutophrissa*" *saba.* We should then have a natural group of African and Malagasy Pierines, between which there would exist no assignable difference in structure, while they would be all alike characterised by the possession of anal tufts like those of *Catophaga* and *Appias.* They may, perhaps, be considered as a section of *Belenois,* but to my mind they seem by their neuration, no less than by the obvious character of the anal tufts, to come much nearer to *Appias,* of which genus I am disposed to regard them as an African offshoot. The South American species *Glutophrissa poeyi, G. margarita, G. castalia,* etc., are very closely related to the present section.†

Although the structural affinity of the forms that have just been discussed with each other and with *Appias* seems undeniable, there is no doubt that in pattern they mostly show a marked divergence from that genus. This appears to be due to mimicry, the models for which are usually supplied by the genus *Mylothris.* Thus *B. lasti* is said by Messrs. Grose Smith and Kirby to be "nearest to *B. trimenia,* Butl."; the latter, however, is a true *Mylothris* with the characteristic neuration of that genus. Considerable resemblance also obtains (as mentioned above, p. 308) between *P. rhodope,* Fabr., and *M.*

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* *P. eudoxia,* Cram., is apparently identical with *P. sylvia* ♀, Fabr.

† Mr. Wallace (*loc. cit.,* p. 312) includes these American and African forms with *Appias, Catophaga,* and *Hiposcritia* in his genus *Tachyris.* For the purposes of the present paper it will perhaps be sufficient if I refer to the American and African species with Appias-like structure and anal tufts collectively as "*Phrissura B,*" while designating *polisma* and *illana* as "*Phrissura A.*"

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poppea, Cram.* The peculiar facies of *G. saba* ♀ seems to be most likely due to mimicry of *Nyctemera apicalis*, a protected moth. Those members of the group that have not been affected by mimicry retain few traces of the original ground-colour, and present very much the appearance of an ordinary male *Appias* (*G. saba* ♂, *G. castalia*, etc.).

The other species usually included under *Belenois*, besides differing in points of structure† from those just discussed, show as a rule a greater persistence of dark ground-colour. Both S and M are usually present in fair development, either separate or fused, and the discoidal patch on the forewings is generally well marked. The markings in several species show a strong resemblance to those of *Synchloe hellica* and *S. johnstonii*; but notwithstanding this, I am disposed to think that *Belenois* proper really represents an offshoot of another part of the Old World Pierine stem, that, namely, represented by *Delias* and *Prioneris*. The distribution of dark and light ground-colour in such species as *B mesentina* might easily be derived from those of *D. belladonna* and *D. eucharis*, and the underside of the hindwing in this and other forms of *Belenois* offers only slight modifications from that of *D. belladonna*. *B. peristhene* exhibits a curious resemblance on both surfaces to *D. nysa* which may perhaps be due to mimicry, although the ranges of the two insects only coincide for a small part of their extent; it is not improbably in any case an indication of real affinity. In neuration, those species of

* I adopt Mr. Trimen's unravelling of the strange confusion that surrounds the synonymy of *rhodope*, Fabr., and *poppea*, Cram. (South African Butterflies, vol. iii., p. 35, and note). The upshot no doubt is that a true *Mylothris* (*Papilio poppea* of Cramer according to Mr. Trimen) is closely copied by at least one Pierine of the "*B*" group of *Phrissura* (*Papilio rhodope* of Fabricius according to the same authority). I do not propose to embark upon the question further than to observe that the "Synonymic Catalogue" identifies the two, and that Mr. Trimen himself unfortunately speaks of *rhodope* in the text, when he must mean *poppea* (ibid. p. 35).

† Negatively by the absence of anal tufts, positively by the presence (in many) of anal hooks, also by the straight direction and greater relative length of the upper disco-cellular nervule in the forewing. In many species of this group, which we may designate *Belenois* proper, the first subcostal branch anastomoses with the costal.

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Belenois in which the first subcostal is distinct are very near *Prioneris*, and the remainder seem to approximate to *Delias* by the partial loss of a subcostal branch, as well as by the contour and direction of the disco-cellular nervules. It is to be observed that some species of *Belenois* proper, like those of the "*Phrissura B*" group, are mimics of various species of *Mylothris*, as *B. thysa* of *M. agathina*. *Pinacopteryx* is probably a collateral or derived branch of *Belenois*; the female of *P. capricornus* retains S and M on both surfaces in a well-marked condition.

We now come to a large and important group of genera which appears to take origin from the older Pierine stock at a point nearest to the genus *Synchloe*. An early stage of divergence is reached by *Teracolus*;* many species of which show the primitive series S and M, together with the discoidal spot and the precostal yellow of the underside of the hindwing. The curious genus *Herpænia* is probably a survival of the links that once united *Teracolus* with *Synchloe*; in neuration it is intermediate between the two, and in pattern, together with aberrations peculiar to itself, it shows points of contact with both. The pattern of the upper surface in *Teracolus* is easily derivable from that of *Synchloe*, the nearest approach to *Synchloe* in this respect being made by the *Idmais* group; compare, for instance, *T. dynamene* with *S. hellica* ♀. But the passage from the underside of the hindwing in *Synchloe* to that of *Teracolus* is more difficult; *Herpænia*, however, enables us to bridge over the interval very fairly, for if *H. tritogenia* and *H. lacteipennis* be interposed between *S. glauconome* and *T. puellaris* ♀, the abruptness of the transition is removed. The pupa of *Teracolus* tends to be boat-shaped, with a sharply-pointed rostrum and large prominent wings†—which characteristics we shall find

* I follow Mr. Butler (Cist. Entom. vol. i., p. 36), with whom Mr. Trimen is in agreement (South African Butterflies, vol. iii., p. 82), in uniting *Teracolus*, *Idmais*, and *Callosune* under the single head of *Teracolus*.

† These features are not equally well developed in all species of *Teracolus*. They are very distinctly shown in pupæ of *T. evarne* (Coll. Hope); pupæ of *T. calais* (Coll. B. Mus.), on the other hand, are slender, less recurved, and nearer the *Ganoris* or *Synchloe* form. The pupa of *T. pleione* (Coll. B. Mus.) is stout, and not unlike that of *Gonepteryx rhamni*; compare Mr. Trimen's description, *op.*

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in a greater or less state of development in all the genera of the particular group of Pierines now under discussion. Other features, which appear first in *Teracolus* and will be met with again later on in the history of the group, are the pinkish fringe of the wings in some species (as *T. wallengrenii*, and often in *T. protractus*) and the faint pinkish *Colias*-like spot or patch at the root of the cell in the hindwing underside of others (as *T. tripunctatus*, *T. cœlestis* ♀, *T. eupompe*, and *T. theogone*).

The genus *Ixias* follows easily upon *Teracolus*, the females of the two genera showing, as usual, a greater affinity in colouring than the males (compare, for instance, the males and females of *T. ione* and *I. marianne* *). Series S is often well preserved in *Ixias*, especially on the underside and in the female; the discoidal spots are also prominent, and begin on the lower surface to assume an ocellate character. In neuration, *Ixias* differs only slightly from *Teracolus*; while the pupa, as shown in drawings by Captain Boys of *I. marianne* and *I. evippe* (Coll. Hope), has the same characters as *Teracolus* in a more strongly-marked condition.

From the usual system of colours and markings in *Ixias*, there can be little doubt that that genus represents the transition from *Teracolus* to *Colias*. The underside of several species of the latter genus (for instance, *C. subaurata*) is strongly recalled by that of *I. marianne*, in which the *Colias*-like condition of the discoidal spots is one of the most noticeable features. The affinity suggested by the colour-pattern is borne out by the structure of the antennæ, which in *Ixias* show a distinct approximation to the gradually thickened form so characteristic of *Colias* and its immediate allies. The pupa in *Colias*, as in *Teracolus*, seems to vary somewhat in form; but in all known cases it shows a tendency, sometimes strongly pronounced, towards the acuminate and boat-shaped outline characteristic of this group of genera.

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cit., vol. iii., p. 82. I refrain from using the terms "wing-covers" or "wing-cases," the inapplicability of which has been shown by Prof. Poulton (Trans. Linn. Soc., 1890, series ii., vol. v., part 5, p. 188).

* Mr. Butler points out the intermediate character of the two African species, *Ixias eulimene* and *I. venatus*. Proc. Zool. Soc., 1871, p. 254.

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The genus *Xanthidia* is transitional between *Colias* and *Terias*, in neuration coming nearer the latter. The pattern on the upper side is scarcely modified from that of *Colias*; on the under surface, however, S has lost much of the distinctness it possesses in so many species of the latter genus, and its relics take part in a general mottling which is very probably protective in object.

In *Terias* the resolution of series S and M, which is still visible in most of the females and many of the males of *Colias*, has usually disappeared from the upper surface; the underside of the hindwings, however, generally shows S in a somewhat modified condition. The pink edging to the wings, so characteristic of *Colias*, and occasionally visible in *Xanthidia nicippe*, is indicated in several species of *Terias*, as *T. messalina*, *T. delia*, and *T. rhodia*. The pupa of *Terias* is more sharply acuminate and recurved than that of *Colias* (see pupa of *T. mandarina* and *T. excavata* in Coll. B. Mus.).

Sphænogona presents in pattern no marked differences from *Terias*, with which genus it is so closely allied. *S. gratiosa*, like *T. agave*, *X. nicippe*, and some other species of these genera, shows a relic of the pinkish *Colias*-patch at the root of the cell on the underside of the hindwing. In neuration, *Sphænogona*, while generally resembling *Terias*, is peculiar in emitting the first and second subcostal branches of the hindwing from a short footstalk beyond the end of the cell. In this respect it is intermediate between *Terias* and *Leucidea*, which latter genus presents no markings to guide us, but has no doubt taken its origin directly or indirectly from *Terias*.* Another probable descendant of *Terias* is the genus *Nathalis*, which agrees very fairly with *Terias* in neuration, except that it wants one nervule in the forewing, probably a branch of the subcostal. There is a striking resemblance of pattern between *N. iola* and *T. elathea* ♂. In the absence of paronychia *Nathalis* reverts to the condition of *Colias*.

Pyrisitia seems to represent an early offshoot of the stem leading from *Colias* to *Terias*. In most points it

* Staudinger and Schatz (*op. cit.*, Theil. ii., p. 66, etc.) consider *Leucidea* to be more closely related to *Pontia* (*Nychitona*) than to *Eurema* (*Terias*). The balance of evidence seems to me to be against this view.

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agrees with the latter genus, but in the position of the subcostal nervules of the hindwing it retains the condition of the former.

A fresh departure from *Colias* is headed by the genus *Meganostoma*, which offers a close resemblance to *Colias* in both structure and pattern.* The series S and M, fairly distinct in the female of *M. philippa*, are also indicated on the upper surface in the males of some of the species. In the males of some other species they are fused above, but in all they are distinguishable beneath. In the outline of the wings *Meganostoma* shows a close approach to *Gonepteryx*, from which genus indeed the females of some of the species are hardly to be distinguished.

From *Gonepteryx* the line passes on to *Amynthia* and *Rhodocera*. All these genera retain many *Colias*-like points, particularly the pinkish patch at the apex of the cell on the hindwing undersurface. The males of the two latter, like those of *Meganostoma* and many species of *Colias*, also possess the well-known patches of raised scales above the subcostal nervure of the hindwing; and in the same two genera is seen for the first time the contrast between areas of flat and raised scales over the whole upper surface of the wings which is so conspicuous a feature in *Catopsilia*, *Phœbis*, and *Callidryas*.

Dercas appears to be an Indian offshoot of *Gonepteryx*. A good transition from the latter to the former is afforded by *D. wallichii*, as pointed out by Mr. Wallace, Trans. Ent. Soc. Lond., 3rd series, iv., p. 398. *Kricogonia* is probably an analogous derived form in the Neotropical Region.

The Eastern genus *Catopsilia* forms with the Western *Callidryas*, *Aphrissa*, *Metura*, and *Phœbis*, a group which clearly belongs to the present section. Their structure and coloration relate them closely to *Gonepteryx*, though in some respects they show signs of a more ancient

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* Mr. Butler (Cist. Entom., iii., p. 46) describes the neuration in the forewing of *Meganostoma* as being like that of *Gonepteryx*, "excepting that the second subcostal is emitted just before the end of the cell." In some individuals, at any rate, the second subcostal is emitted *at* the end of the cell, and in *M. cesonia* it may even be thrown off *after* the end of the cell, as often in *Colias*. This indeed is the condition represented in Cist. Entom., vol. i., pl. ii., fig. 4.

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ancestry. The retention of the pink patch on the underside of the hindwing, and (in several species) of the pink fringe, brings them near to *Colias*; to which they also approximate by the form of the antennæ, by the very general occurrence of special patches of raised scales on the hindwing of the males, by the frequent presence, especially in the females, of the series S and M and the discoidal spots in a more developed condition than that characteristic of *Gonepteryx*, and by the common tendency of the latter spots on the lower surface towards ocellation. The oldest forms of the whole group appear to be those contained in the genus *Catopsilia*. *C. florella*, for example, is very closely related to *Gonepteryx*, and still more nearly to *Amynthia*, with which it corresponds in colour and in texture of wings (compare especially the undersides of *C. florella* ♂ and *A. clorinde*). The peculiar thickening of the nervures, especially the subcostal and median, on the under surface of the hindwing, which in *Gonepteryx* and *Amynthia* give almost the effect of a folding of the surface, is plainly visible in *C. florella*. In neuration, *C. florella* agrees minutely with *A. clorinde*. Another indication of the superior antiquity of the Eastern *Catopsilia* as compared with the Western *Callidryas* is found in the shape of the pupa. This in *Catopsilia* (as remarked by Mr. Trimen, *op. cit.*, vol. iii., p. 184) is only moderately acuminate and slightly recurved, thus showing no very great departure from the *Colias* and *Gonepteryx* form; in *Callidryas*, however, so far as is known, it is always very sharply acuminate and strongly recurved, showing an exaggeration of the "boat-shaped" condition almost as marked, in a different way, as that of *Euchloe*.* The *Colias*-like pink edging appears also to be found more frequently in *Catopsilia* than in *Callidryas* (though it occurs in *Callidryas sennæ*); and while the *Colias*-like spot at the root of the cell on the underside of the hindwing occurs in both the Eastern and the Western divisions of the group, it has in the latter lost the ancestral pink tinge

* I agree with Mr. Butler that the pupa figured in Lep. Exot., pl. xlv., fig. 4*a*, as *P. agarithe* is very probably that of *C. philea*. It closely resembles a pupa of *C. eubule* in the Hope Collection, which last exactly corresponds with Burmeister's figure in the "Atlas de la Description Physique de la Rép. Argent.," 1880, pl. v, fig. 2.

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which it usually retains in the former. It is not very easy to form an opinion as to the relative antiquity of the four Western genera; if we are to judge from the pupæ, so far as they are known, it would seem that *Aphrissa* has undergone less modification than either *Phœbis* or *Callidryas*. Another possible indication of the greater antiquity of *Aphrissa* is afforded by the shape and size of the palpi, which in this genus, especially in the females, show less departure than is the case in either *Phœbis*, *Metura*, or *Callidryas*, from the *Colias* and *Gonepteryx* type. *Phœbis* with its offshoot *Metura*, from which it differs only in the contour of the wings, is probably the most highly specialised genus of all; this being shown by the possession of a tuft of long hairs on the hindwing of the male, which is not found in *Aphrissa* and *Callidryas*, and by the absence in most species of nearly all indication of dark ground-colour from the upper surface. It is remarkable that the Western genera just treated of are less closely akin to the South American *Amynthia* than is the Eastern genus *Catopsilia*, and especially the African *C. florella*.

The genus *Eronia* seems to represent a branch of the present section which leaves the main stem somewhere between the points marked by *Teracolus* and *Ixias*. With the exception of the presence of a fifth subcostal in the forewing (which, however, is sometimes wanting), the neuration of *Eronia* agrees fairly with that of *Teracolus*. The antennæ in *Eronia* differ in different species, but are all intermediate between the *Teracolus* and the *Colias* type; and the pupa of *E. cleodora*, with its very convex and prominent keel, is like that of one of the stout forms of *Teracolus*, e.g., *T. evarne*. The assemblage of species distinguished by Mr. Butler as *Nepheronia* is probably older than *Eronia* proper, as is shown by the tendency of its antennæ to terminate in a definite club, like the more ancient genus *Teracolus*. *N. thalassina* also retains a primitive Pierine feature in the yellow precostal streak of the hindwing underside, which again is found in some species of *Teracolus*. *Eronia* proper, on the other hand, is slightly nearer to *Teracolus* in neuration. The curious *Eronia* (?) *lucasii* from Madagascar, which has only four subcostal nervules in the forewing, and whose antennæ are slender, with a definite club, is probably one of the oldest and most

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generalised members of the *Eronia* and *Nepheronia* group now extant.*

The last-named insect presents points of resemblance with *Hebomoia*, which again seems to be an offshoot of the same stem, that, namely, leading from *Teracolus* towards *Ixias* and *Colias*. The pupa of *Hebomoia glaucippe*, as figured by Horsfield (E. I. C. Catalogue, see Distant, Rhopal. Malayana, 1882—6, p. 283) and Moore (Lep. Ceylon, 1880—1, pl. 49, fig. 1*b*), is stout, moderately acuminate, and much recurved, in which particulars it agrees well with the pupa of *Ixias*.

Most of the insects of the genera *Eronia*, *Nepheronia*, and *Hebomoia*, retain in greater or less measure some portions of the primitive marginal and submarginal series. These, as usual, are most often to be met with in the females, and in several species of *Nepheronia* are utilised in the formation of mimetic patterns modelled on those of various Danaids and sometimes of other Pierines. A noticeable feature in some members of this group, pertaining chiefly to the males, is the brightening of the pale ground colour of the apex of the forewing into a brilliant yellow or orange patch. This character is first seen in *Teracolus*, where the orange of the apex may further deepen into crimson or violet; it passes on to *Hebomoia*, to *Ixias* and to *Rhodocera*; in *Colias*, however, it gives place to a general yellow or orange suffusion of the pale ground colour, still strongest in the males.† It is found in *Eronia* (?) *lucasii* and *E. leda*, but not in other members of that genus; it is also absent in *Nepheronia*.

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* *E.* (?) *lucasii* was originally described (as *Callidryas lucasi*) by Grandidier (Rév. et Magas. de Zool., Aug. 1867, p. 273). He, however, took the female for the male, and his supposed female *C. lucasi* is really the female of *Catopsilia thauruma*. Mabille in the Hist. Phys. Nat. et Pol. de Madagascar, vol. xviii., 1887, p. 281, gives a correct description of both sexes under the name of *Eronia lucasii*, but makes no mention of Grandidier's mistakes. This species will not come into the genus *Eronia* as at present defined. By Brauer and others it has been called a *Ptychopteryx*; the latter genus, however, was characterised by Wallengren from a species of *Teracolus* (*T. subfasciatus*, Swains., Vid. Trimen, South African Butterflies, vol. iii., 1889, p. 92), and has no real claim to stand.

† In many species of the latter genus, indeed, the females may, as is well known, revert almost entirely to the ancestral white.

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This last feature in coloration is again met with in *Eroessa* and *Euchloe*, the neuration of which genera corresponds pretty closely with that of *Eronia*, not only in the presence of five subcostal branches in the forewing, but also in other particulars. The general likeness between *Eronia leda* and *Euchloe belia*, Linn., is very striking, and strongly suggestive of a near affinity between them. The well-known form of the pupa in *Euchloe* is an exaggeration of that seen in *Eronia cleodora*.* In some other points, however, *Euchloe* is nearer to *Colias*, as in the strong development of the discoidal spot in the primaries, and in the possession by some species of pink legs and a pink edging to the wings. This last feature is characteristic of the *charlonia* group of *Euchloe*, and is best seen in *E. lucilla*. The underside of the hindwing in the same group has very much the character of the corresponding region in *Colias palæno*, including the pale undeveloped discoidal spot. The antennæ, however, of *Euchloe* are very distinct in form from those of *Colias*, and indeed are not much nearer those of *Eronia*. On the whole it seems most likely that *Euchloe* is a somewhat aberrant branch which takes its rise from the Pierine stem at a point near the divergence from the same stem of *Hebomoia* on the one hand, and *E.* (?) *lucasii* with the rest of the *Eronia* and *Nepheronia* group on the other. The isolated form *Eroessa chilensis*, which in neuration approaches the older *Eronias* (as *E.* (?) *lucasii*) and *Hebomoia*, is perhaps a survival of a once more widely-spread and numerous assemblage, among which were to be found the immediate ancestors of the present-day *Euchloes*. *Zegris* seems to be a somewhat highly modified offshoot of the *Euchloe* branch.

We must now retrace our steps as far as to the group which I have called "Pierines of the second grade," those, namely, that are typified by *Delias* in the Eastern and *Catasticta* in the Western hemisphere. The latter genus with its near ally *Leodonta* forms a starting-point for a New-World division of the Pierine stem, which, if not equal in magnitude to the great division headed in the

* The pupa in *Euchloe* is not always recurved. See Edwards's figures of *Anthocharis* (*Euchloe*) *genutia* and *A. ausonides* in "Butterflies of North America." See also Schatz, Exotische Schmett., Theil ii., 1892, p. 71.

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Old World by *Delias*, *Prioneris*, and *Metaporia*, is nevertheless of high importance and very great interest.

The first departure from the condition of *Catasticta* seems to be that taken by the butterflies of the genus *Pieris* as restricted by Butler, closely associated with which must come the American species of *Mylothris*. The underside of *Pieris locusta* exhibits a pattern which is but little removed from that of *Catasticta*, the yellow streaks and red basal patches being still apparent on the underside of the hindwing; while the upper surface of both wings is shared between the original dark and intrusive light ground colour in much the same manner as in *C. ctemene*, *C. corcyra*, and other species of *Catasticta*. In *Pieris* as a whole, the dark ground-colour has to a great extent disappeared from the upper surface; several species however (as *P. pylotis* and *P. buniæ*) retain a discoidal spot in the forewing, which in some, as *P. thaloe* ♀, is connected with a dark streak along the costa, and in others, as *P. demophile* ♀, is included in a larger remnant of ground-colour which passes as a dark fascia obliquely across the wing from the costa to the outer border. The underside of the hindwing in this genus tends to lose the *Catasticta*-like character preserved in *P. locusta*, in consequence of a general paling which takes effect first in the basal half and spreads outwards (as in *P. demophile*), until in such species as *P. buniæ* it reduces the wing to very much the same condition as that seen in *Ganoris brassicæ* or *G. rapi*. The ground-colour in *P. buniæ* and *P. pylotis* is indeed even paler than in these species of *Ganoris*, being without the powdering of black scales which the latter possess; the hindwing however of both *P. buniæ* and *P. pylotis* retains a discoidal spot, and, as has been already noted (pp. 287, 289, note), the predominance of the paler colouring is never so great as not to leave unmistakable relics of the yellow streaks and red basal patches.

The genus *Leptophobia* appears to be a kind of continuation of *Pieris*. The arrangement of light and dark ground-colour preserves a parallel course in the two genera, and the inclusion of the discoidal spot of the forewings in a dark fascia which passes from the costa for a greater or less distance obliquely towards the outer margin is a common feature in *Leptophobia* as well as in *Pieris*. In the present genus the underside of the hind-

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wings is almost uniformly pale, but distinct indications of the primitive red patches are nevertheless still to be met with (see p. 287).

There would also seem to be little doubt that the American species allied to *M. pyrrha*, which are included by Mr. Butler* under *Mylothris*, with the neuration of which they agree, are closely related to *Pieris*. The pattern of every one has been more or less altered by mimicry, but in those males whose upper surface is unaffected by this kind of modification, the arrangement of the dark and light ground-colour is seen to present the ordinary features of *Pieris* or *Leptophobia* (compare, for instance, the upper side of *M. pyrrha* ♂ with that of *P. thaloe*). In *M. lorena* is found an oblique dark bar crossing the forewing just as in *P. demophile* and *L. stamnata*, this mark being utilised, both in *M. lorena* and the female of *M. pyrrha*, for the formation of the mimetic pattern. It has already been shown† how the primitive yellow streaks and red basal patches have been turned to account in the same direction on the underside of the hindwing, which, from the additional necessity for protection experienced by the insect when at rest with its wings closed, becomes the most important field for the mimetic process. It may be here remarked that the antennæ of these American forms, while agreeing in character with those of *Leptophobia*, *Pieris*, *Catasticta*, *Leodonta*, and the genera allied to these last, differ conspicuously from those of *M. agathina*, *M. poppea*, and the other African species of *Mylothris*.

Hesperocharis diverges somewhat widely from the genera last discussed, both in neuration and in the character of its antennæ; it retains, however, in many cases indications of the primitive marginal and submarginal dark series in a more recognizable form than any (see, for instance, the chevrons on the underside of *H. erota*, which represent series S). The yellow streaks

* Proc. Zool. Soc., 1872, pp. 36-38. It appears to me that the neuration of the American forms of *Mylothris* is simply that of *Pieris*, *minus* the third subcostal nervule in the forewing, which branch is already almost obsolete in the latter genus.

† See above, p. 286. The transitional series which is there made to begin with *M. lypera* and *M. lorena* might easily be carried back to *P. thaloe*, which shows the true Pierine pattern all ready, as it were, to take on the mimetic condition of the other species.

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and red basal patches, present in all species of *Hesperocharis*, are in some (as *H. nereis*) marked with special distinctness. The curious manner in which these have been made use of in *H. hirlanda* for the production of a mimetic pattern, has already been fully discussed (p. 286).

I cannot but think that *U. monuste* shows by its pattern that it stands on a level with *Pieris* as a derivative from the *Catasticta* group. Its neuration hardly differs from that of *Pieris*, and it would probably be more appropriately placed (together with its immediate allies, *U. joppe*, *U. suasa*, etc.) in or near that genus than with *U. cynis* in Mr. Distant's genus *Udaiana*, as at present in the National Collection.

The position of the genus *Dismorphia* is not easy to determine. The pattern of those species that appear to have undergone least modification may, however, be derived without much difficulty from *Pieris* or *Leptophobia*;* and the persistence in some cases of the red basal spots has already been remarked (see p. 285). The structure of the antennæ points to the same line of ancestry. On the other hand, the very remarkable neuration is quite unlike that of *Pieris*; a certain approach to it, however, is made by *Hesperocharis*, which is almost without doubt a close ally of that genus. *Moschoneura*† is very nearly akin to *Dismorphia*, from which it differs only slightly in neuration; while the Palæarctic genus *Leptosia* has characters which link it with both.‡ We may probably regard the three last-named genera as terminal twigs of a branch now lost, which left the main stem at or near the genus *Pieris*, and of which *Hesperocharis* is a still earlier offshoot. In *Dismorphia* and a few species of *Moschoneura* much of the original colouring has been retained and modified for purposes of mimicry. In *Leptosia* and the remainder§ of *Moschoneura* this colouring has given way to the usual Pierine invasion of white.

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* A somewhat different and, as it seems to me, less probable view is advanced by F. Müller, Jenaische Zeitschr., x., pp. 1–12.

† The figure in Cistula Entomologica, vol. i., pl. iv., fig. 9, omits the second discoidal of the forewing.

‡ The forewing is nearer to *Dismorphia* and the hindwing to *Moschoneura*.

§ *Pseudopieris* of Godman and Salvin.

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2. *The evidence of distribution.*

It now remains to briefly indicate the bearing of the geographical distribution of the various forms that have been mentioned upon the question of their kinship and relative antiquity.

As we have already seen, the oldest form of Pierine now extant is probably *Eucheira socialis*. This insect appears to be as limited in its geographical range as it is isolated in its zoological position, for it is found only in the mountain-ranges of Mexico, which may be considered as a southern extension of the "Rocky Mountain" division of the Nearctic Region.* Its nearest allies appear to be Behr's two species of *Neophasia* (see p. 303), which inhabit the same region with itself, and the *Pontias* and *Metaporias* of the high lands of Central Asia, most of which forms are known to retain the ancient larval habit of spinning. These facts seem to point to the conclusion that *Eucheira* is the relic of an archaic group of Pierines which once occupied the great mountain regions of both the Palæarctic and Nearctic continents, and whose immediate descendants, still represented in the East by *Metaporia* and *Pontia*, have in the West become extinct (unless Behr's *Neophasia* be a survival) after giving origin to the group of genera headed by *Catasticta*.

From one or other of these two primary stems, the Eastern or the Western, nearly the whole of the existing genera of Pierines may be derived. There are, however, a few exceptions, which, perhaps, constitute relics of an ancient Pierine fauna coeval with the groups above mentioned, but not, like them, the progenitors of a numerous and varied offspring. The chief of these are the genera *Elodina* and *Nychitona*, the former of which is entirely confined to the Australian Region, while the latter has a very wide distribution throughout the Ethiopian, Oriental, and Australian. The African

* I here follow Mr. Sclater's division of the earth's surface into six Zoological Regions, which arrangement, adopted by Mr. Wallace in his "Geographical Distribution of Animals," 1876, has stood the test of time and experience better, in my opinion, than any alternative distribution that has been proposed. I also adopt, for convenience, the smaller divisions, or "sub-regions," as determined by Mr. Wallace in the above-named work.

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species of *Mylothris* belong possibly to the same category.

The genera derived from the *Catasticta* group remain, for the most part, within the confines of the Neotropical Region. This is the case with *Pieris, Leptophobia, Hesperocharis,* the American species of *Mylothris,** *Dismorphia, Moschoneura,* and those species allied to *monuste* at present included in the genus *Udaiana.*† It is remarkable that the Nearctic Region does not furnish a single species that can be supposed to be derived from the present stem.‡ Inasmuch, however, as the Palæarctic genus *Leptosia* seems to belong rather to this than to any Eastern branch, the conjecture may be hazarded that connecting forms now extinct once occupied the Nearctic Region, from which the Palæarctic continent received the forerunners of its present *Leptosias,* probably by way of Behring Strait.

Turning now to the Eastern *Metaporia,* which inhabits the borderland between the Palæarctic and Oriental Regions, we find it emitting one clearly-defined branch in the Palæarctic direction. This is the branch to which belong the various species of *Pontia,* as *P. nabellica, P. soracta, P. hippia, P. belucha, P. leucodice,* and *P. cratægi.* In the Chilian or Andesian division of the Neotropical Region we find the genus *Tatochila,* which appears not to belong to the regular Neotropical Pierine stock, but to be closely related to the Palæarctic *Pontias.* It is conceivable that the latter stem may have spread from Asia into the western portion of the Nearctic continent, and thence down the mountain-chains to the south. *Neophasia menapia,* at present inhabiting the Californian and Rocky Mountain subregions, seems to me to be more nearly allied to both *Pontia* and *Tatochila* than (as Behr thinks) to *Eucheira socialis,* and may very possibly be a relic of the original invasion. Another indication of the same invasion is afforded by the genus *Phulia,* now found with the nearly-allied *Tatochila* only in the Andesian or Chilian

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* See p. 320, note.

† See p. 321.

‡ The instance of *U. monuste*, which straggles into the southern districts of the Nearctic Region, hardly forms an exception to the above statement.

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sub-region, to which it no doubt made its way along the great mountain-chains in a similar manner. Its close ally, *Baltia*, remains in the high lands of Central Asia, where it bears much the same relation to *Synchloe* as *Phulia* to *Tatochila*. Another early offshoot from the Eastern *Pontia* stem is *Mesapia peloria*,* which has no representative in the Western Hemisphere.

The above descendants of the mountain *Metaporias* belong, as has been seen, in the first place, to the Palæarctic and western portion of the Nearctic Region, only reaching the Neotropical by extension along the chain of the Andes. Other derivatives of *Metaporia*, however, took their course directly southwards. The first of these is the *Delias* and *Prioneris* group, the more ancient members of which are, speaking generally, to be found in the northern portion of the Indian peninsula, while the Australian and other southern forms represent, as a rule, a somewhat later stage of development. Another is the important branch headed by *Huphina*, which genus, like *Delias*, has spread downwards throughout the Oriental Region, and by way of the Indo-Malayan and Austro-Malayan islands to the Australian continent. The Australian species of *Huphina* are clearly derived from the Oriental, and those forms (such as *H. phryne* ♀) which are nearest to *M. agathon* in colouring are also its closest neighbours geographically. Of the two genera (*Hiposcritia* and *Catophaga*) which appear to be immediately derived from *Huphina*, the former is confined to the Oriental Region; while the latter, like *Huphina* itself, has spread along the Austro-Malayan Islands to the Australian mainland. This is also the case with *Appias*,† the origin of which genus from the *Catophaga* stock is no doubt to be assigned to the Oriental Region. But, unlike the other genera, *Appias* seems to have extended its borders westwards, and to have given rise to the "*Phrissura B*"‡ group in the Ethiopian Region, and even to *Glutophrissa* in the Neotropical. If this be the real origin of these two latter genera, we have to enquire how they reached the African and South American continents respectively.

* See p. 304.

† It would seem, however, that no true *Appias* actually reaches the Australian continent.

‡ See p. 309, note.

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With regard to the first, there is little difficulty in supposing the passage to have been effected by land either now or formerly existing, the Ethiopian Region having been in this, as in so many other instances, first entered from the north. But it is not easy with our present knowledge to imagine an overland passage for these butterflies from the Oriental or Ethiopian Region to the Neotropical. The northward route, which we saw to be the one probably adopted by the ancestors of the Chilian *Phulias* and *Tatochilas* in spreading from Central Asia, is excluded in the present instance by the entire absence of any trace of such a passage from both the Palæarctic and Nearctic Regions; and although a transit by way of a formerly existing "Antarctica" is conceivable, it would seem more likely that the crossing from east to west was effected in the region of the tropics. After all, however, the difficulty of supposing an Atlantic sea-passage is not overwhelmingly great. The unusual facilities possessed by insects for crossing large extents of sea have been remarked by many writers,* and among insects the butterflies of the Pierine group are especially given to migration for great distances in countless hordes.† It is worth noting that in the case of each of the other three chief Pierine genera whose present distribution seems to have involved one or more long sea-passages, *i.e.*, *Terias*, *Colias*, and *Callidryas*, special observations exist of their migratory propensities. In 1874 a large swarm of *Terias lisa* reached the Bermudas from the American continent;‡ the swarm of butterflies described in a well-known passage‖ by Mr. Darwin consisted chiefly of a species of *Colias*; while descriptions of the migratory flight of *Catopsilia* and *Callidryas* are numerous, among the most striking pieces of testimony being that

* See especially Wallace's "Geographical Distribution," 1876, vol. i., p. 32; and the same author's "Darwinism," 1889, p. 359, etc.

† Trimen, Trans. Ent. Soc. Lond., 1870, p. 382; "South-African Butterflies," 1887, vol. iii., p. 32. Moore, "Lepidoptera of Ceylon," 1880, 81, p. 116. Distant, "Rhopalocera Malayana," 1882—86, p. 285, etc. Mr. Trimen suggests that there is "an evident connection or relation between these wonderful migrations of certain species of *Pierinæ* and the well-known habit of nearly all the members of the Sub-family of flying straight onward in one direction."

‡ "Psyche," Dec. 1875, p. 121.

‖ "Voyage of the Beagle," ed. 1860, p. 158.

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of Mr. Spruce, who saw *Callidryas* "launching boldly out over the Pacific Ocean."*

The earliest species of *Synchloe* were undoubtedly differentiated from *Pontia* or *Baltia* in the Palæarctic Region, from which the genus spread (probably eastwards) into the Nearctic. *Synchloe* proper can hardly be said to enter the Indian Region,† but in its progress westwards it has sent an offshoot downwards into the Ethiopian, consisting of *S. johnstonii* and *S. hellica*. *S. glauconome* of Arabia and Egypt remains to mark the course of the invasion. *Ganoris*, a further Palæarctic development of *Synchloe*, has accompanied that genus into the Nearctic Region and has also spread into the Oriental. A curious extension of the range of the Palæarctic *G. rapæ* into the Nearctic Region has been in progress during the last thirty-three years, the first transatlantic specimens having been seen at Quebec in the year 1860.‡ This introduction was undoubtedly effected by human agency, and differs from the natural passage of species between the two Regions in having taken place by the Atlantic instead of the Pacific route.

Though *Synchloe* itself is far more characteristic of temperate than of tropical districts, it has given rise to a large and important Pierine branch which has spread far and wide through tropical and temperate parts alike. The birthplace of *Herpænia* and *Teracolus*, the two earliest members of this extensive section, is apparently the eastern portion of the Mediterranean division of the Palæarctic Region; from which locality the former has spread through Arabia and Abyssinia into the African continent, while the latter has not only followed *Herpænia* into Africa, but has also largely occupied the two western Oriental sub-regions. Those forms of the genus *Ixias* that show least divergence from *Teracolus* are found in the Nile provinces of Eastern Africa, but the bulk of this genus has moved eastwards, its distribution being characteristically Indian. A few species, however, are found in some of the Indo-Malayan islands, and in Austro-Malaya as far east as Timor.

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* Journal Linn. Soc., Zool., ix., pp. 355—357.

† See Wallace, Trans. Ent. Soc. Lond., 3rd series, iv., pp. 242, 3.

‡ Scudder, "Butterflies of the Eastern United States," 1889, vol. ii., pp. 1175-1190; Edwards, "Butterflies of North America," vol. i., 1868-72, *sub. voc. P. virginiensis*.

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To the same borderland of Western Asia and Eastern Africa may be assigned the place of origin of *Nepheronia*, which has sent a western branch into Africa, and an eastern into the Indian peninsula and Malayan islands, one species reaching the Australian continent. The African branch has given rise to *Eronia* proper. Attention has already been drawn to the curious fact that the form which links the *Eronia* group most closely with *Teracolus*, viz., *E.* (?) *lucasii*, survives in Madagascar. *Hebomoia*, another offshoot of this part of the Pierine stock, is now almost entirely Malayan; its place of origin was, however, in all probability further west. The birthplace of *Euchloe* is problematical, but the present distribution of the *charlonia* group, which seems to contain the oldest members of the genus, would appear to make it probable that the Mediterranean sub-region witnessed the rise of this, as of so many other more or less direct descendants of *Synchloe*, from which central area it successively overspread the Palæarctic and Nearctic continents. The isolated geographical position of *Eroessa chilensis* is very remarkable, its affinities being apparently with Eastern rather than Western forms. It is probably, as before suggested, a solitary survival of a once more widely-spread group, among which were to be found the immediate ancestors of the present-day *Euchloes*.

No other genus in the whole sub-family has so extensive a range as *Colias*, species of which are found in every one of the six great Zoological Regions. Here again, I have little doubt that the site of original divergence is Asiatic, and is most nearly represented in the present condition of the earth's surface by the borderland between the Palæarctic and Oriental Regions on the north-west frontier of India. From this centre one or two species have ranged into South Africa and the Indian peninsula; but the greater number have turned northwards, and after populating the Palæarctic and Nearctic continents with numerous species, have penetrated to the circumpolar lands within the Arctic Circle, have passed down the great mountain chains of Central and South America to Chili and Patagonia, and have even established outposts in Venezuela and the Sandwich Islands.*

The powers of dispersal possessed by the genus *Terias*

* The occurrence of *Colias* in the last-named locality is, however, not entirely free from doubt.

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are almost as remarkable as those of *Colias*; perhaps even more so when we take into account their weak flight, and the fact that their migrations must have been intertropical. Mr. Wallace, however, has drawn attention to their habit of frequenting "gardens and plantations and skirts of forests rather than their deeper recesses," and also of "assembling on the margins of streams and on the sea beach," and has remarked that "these habits lead to their being frequently carried off by winds," and that "it is thus perhaps that some of the species have so wide a range and offer such perplexing variations."* Whatever may have been their means of dispersal, there can, I think, be no doubt that they took their rise from the *Colias* stock in the Western Hemisphere, the line of descent passing through *Xanthidia* to *Terias* and *Sphænogona*; *Pyrisitia*, *Nathalis*, and *Leucidea* being given off by the way. All these genera are mainly Neotropical with Nearctic extensions. *Terias* itself, however, as is well known, so far from remaining within these limits, has overspread the warmer portions of the Ethiopian, Oriental, and Australian Regions, and is even found in the Manchurian sub-region of the Palæarctic.

It seems on the whole most probable that the origin of *Gonepteryx* is also to be referred to the Western Hemisphere, where *Meganostoma* marks the transition from *Colias*. *Gonepteryx* itself seems to have passed to the north by way of California and so across into the Palæarctic Region, while *Rhodocera* and *Amynthia* represent a Neotropical development of the same stock, the Central American genus *Kricogonia* perhaps remaining near the original seat of divergence. *Gonepteryx* having reached the Palæarctic Region has extended to its westernmost extremity. Its only offshoot appears to be *Dercas*, which probably arose in the debateable Manchurian area, where the Palæarctic and Oriental faunas are much mixed, and thence spread southwards through the Indo-Chinese sub-region to Sumatra and Borneo.

Catopsilia and *Callidryas*, like *Terias*, must, it would seem, have undergone intertropical migration. Their oldest forms appear to be *Catopsilia florella*, *C. hyblæa*,

* Trans. Ent. Soc. Lond., 3rd series, iv., p. 320. See also above, p. 325.

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C. thauruma, etc., which are probably derived from the Neotropical genus *Amynthia*, coming nearest to *A. clorinde*. Inasmuch as all these are African insects, and the New World *Callidryas*, *Phœbis*, and *Metura* are less closely allied to *Amynthia*, it seems necessary to suppose that the earliest forms of this group in the Neotropical Region have become extinct, the present *Callidryas* group surviving as their modified descendants; while an early dispersal of these ancestral forms took place across the Atlantic to Africa, of which invasion *C. florella*, etc., remain as comparatively unmodified relics. The Oriental and Australian *Catopsilias* are the ultimate developments of this invasion.

The distribution of *Belenois* is remarkable, the bulk of the species belonging to the Ethiopian and Australian Regions. The Oriental Region is poorly supplied, except for the abundant *B. mesentina*, which is found in all parts of the Indian peninsula, and even enters the Mediterranean district of the Palæarctic Region as far as Asia Minor. Notwithstanding the present poverty of the Oriental Region in species of *Belenois*, it seems probable that this area is really the birthplace of the genus, which, as we have seen, appears to be derived from that primitive part of the Pierine stem now represented by *Delias* and *Prioneris*. *B. mesentina* and *B. taprobana*, of India and Ceylon, may probably be regarded as survivors of the original race of *Belenois*, whose descendants have spread south-eastwards to Australia, and south-westwards to Madagascar and the African continent. *Pinacopteryx* is in all probability a local modification of *Belenois* within the Ethiopian Region, while *Daptonura*, whose history is otherwise hard to account for, may perhaps have originated from a branch of the African *Belenois* which at some remote period found its way westwards across the Atlantic.

In concluding this paper I wish to express my great indebtedness to several friends who have given me valuable help during its progress. It was by the kindness of the late Professor Westwood that I was enabled to begin the study of the Pierine group in the Hope Collection at Oxford, and the facilities for work afforded me by him have been continued and increased by his successors in the charge of the department, first by

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Mr. W. Hatchett Jackson, and now, in a special manner, by Professor Poulton, F.R.S., the present occupant of the Hope Chair, at whose request I have undertaken the arrangement of this part of the Hope Collection. I am also under great obligations to Colonel Swinhoe, who has very kindly helped me in various ways, and especially in the determination of the Eastern species, of which he has so intimate a knowledge. Lastly, my thanks are due to the members of the staff of the Natural History Department of the British Museum, particularly to Messrs. A. G. Butler, W. F. Kirby, and F. A. Heron, who have given me every assistance in examining the fine series of *Pierinæ* preserved in the National Collection.

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° Probably not a *Mylothris*; see Trimen, "South-African Butterflies," vol. iii., 1889, p. 35, note.

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EXPLANATION OF PLATES III., IV., & V.

PLATE III.

FIG. 1. *Eucheira socialis.*
2. *Catasticta bithys.*
3. *C. ctemene.*
4. *Delias belladonna.*
5. *D. eucharis* ♀.
6. *D. nysa* ♂.
7. *Metaporia agathon.*
8. *Huphina phryne* ♀.

PLATE IV.

FIG. 9. *Catophaga paulina* ♀.
10. *Appias clementina* ♀.
11. *Hiposcritia lalage* ♂.
12. *Mylothris agathina.*
13. *Belenois mesentina* ♂.
14. *B. peristhene.*
15. *Synchloe daplidice* ♀.
16. *Ganoris napi* ♀.

PLATE V.

FIG. 17. *Teracolus hewitsonii.*
18. *Ixias marianne* ♀.
19. *Hebomoia glaucippe* ♀.
20. *Colias hyale* ♀.
21. *Catopsilia crocale*, var. *flava* ♀.
22. *Callidryas philea* ♀.*
23. *Eronia leda* ♀.
24. *Euchloe charlonia.*

These figures are only designed to illustrate the actual points mentioned in the text. They are not intended to show specific characters. The same letters and numbers stand for the corresponding markings throughout all the figures. See explanations in the text, pp. 254, 264, 269, 273, 274.

NOTE.—In Fig. 15, S 8 is placed one space too high up.

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* This figure was drawn from a specimen in the Hope Collection, which had been erroneously labelled *C. thalestris.* The error has unfortunately found its way into the plate.

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X. *Some notes on the* Micro-Lepidoptera *whose larvæ are external feeders, and chiefly on the early stages of* Eriocephala calthella (*Zygænidæ, Limacodidæ, Eriocephalidæ*). By Thomas Algernon Chapman, M.D., F.E.S.

[Read Feb. 7th, 1894.]

Plates VI. & VII.

I present these notes now, as there seems little probability that I shall, at an early date, be able to carry further my observations on *Eriocephala*, and it is desirable to put them, so far as they go, at the disposal of anyone who may wish to continue them; and I present along with them sundry notes that tend to confirm the view, that the *Zygænidæ, Limacodidæ*, and *Eriocephalidæ* form a group which, though the last member is as low as the lowest *Tineæ*, and the first as high as Butterflies or Noctuæ, has nevertheless been evolved on its own lines, from a common source, as a separate branch of Heterocera.

The broad facts of the pupal structure, and the slug-like form and habit of external feeding of the larva, probably suffice to support this view; but further points of alliance are no doubt most useful in confirmation.

It becomes necessary, in the first place, to relate my observations on *Eriocephala calthella*, since it is largely to these observations that I owe the confidence I feel that this grouping of families is justified by fact.

The genus *Micropteryx* was divided by Stainton ("A Monograph of the British Species of the Genus *Micropteryx* of Zeller," Trans. Ent. Soc. Lond., new series, vol. i., pp. 26–40, 1850–1) into two sections—A. *Eriocephala*, of Curtis, and B. *Micropteryx*, Hübner. At that time the larvæ were unknown, and the division was made by the neuration. Shortly after, the larva of *Micropteryx*, Hübner, was discovered, and very soon material was accumulated that would have justified what must now be done, viz., separating the *Eriocephalæ* from the *Micropteryges*, not only as a distinct genus but as a separate

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family; and the following might be a brief outline of the characters, distinguishing them from each other and from other forms.

Micropterygidæ. Ovum: Ovoid in shape, delicate, transparent, and nearly colourless; laid in the parenchyma of a leaf.

Larva: Leaf-mining, without legs.

Pupa: In a dense subterranean cocoon, escaping therefrom for emergence; segments of abdomen all "free;" has large jaws, used for assisting the pupa out of cocoon, like those of *Trichoptera*, but larger and more elaborate.

Imago: Large six-jointed maxillary palpi, no trace of jaws, 9th and 10th abdominal segments of ♀ form a knife arrangement for piercing leaves for oviposition; 8th is an external ordinary (but terminal) segment. (In *Adelidæ* the 8th is absorbed in the piercing apparatus, and the 7th is the external terminal segment.)

Eriocephalidæ. Ovum: Spherical, opaque, covered with a snow-like coating, laid externally.

Larva: Short, square, and angular, with 8 rows of globular appendages, and 8 pairs of abdominal legs, an anal sucker, long antennæ, feeding exposed.

Pupa: (Probably not unlike a *Nepticula*, and in a cocoon above ground.) I have only seen the head and antenna piece, and cannot build up the whole pupa from that with any confidence.

Imago: Six-jointed maxillary palpi, used as feeding hands: well-developed, serviceable jaws; ovipositor simple, tubular, of three pieces, last abdominal segment the 7th. There is also the neurational difference noted by Stainton.

I propose, then, to accept and accentuate this division, leaving the name *Micropteryx* for the "higher" group, whose larvæ have been known for so long, and as to whose oviposition and corresponding structure of the imago I had the pleasure of assisting my friend, Dr. Wood, in his researches, though in view of my observations on their pupæ, I think it must be very doubtful whether they can be called the "higher" group any longer.

The *Eriocephalidæ* attracted my renewed attention when engaged in working out the oviposition of the *Micropteryges*. In the far-off days, when the life-histories

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of *Micropteryx* were being recorded in the "Annuals," I was much impressed with the resistance of the *Eriocephalidæ* to investigation; but looking, as I then did, on the *Tineina* generally as subjects fit only for the work of past masters, I had little idea that they would continue this resistance for so many years, and that it would be left for me to make the first impression against it.

It was evident, on comparing the structure of *calthella* with that of *purpurella*, or other *Micropteryx*—as indeed it was to a great extent without that knowledge—that the habits of *Eriocephala* must be very different from those of *Micropteryx*.

I believe my observations have been made on both *calthella* and *seppella*, and I have not always been very careful to determine which species I had in hand, and may have had others. But in the observations I have made I have not determined that any decisive differences were observable.

In *calthella*, then, the ovipositor is quite short, simple, and tubular; no knives, or rods, or other complex apparatus, as in *purpurella*. The egg, therefore, must be laid in a very easy, simple way. This is confirmed by noticing that the egg is large and spherical, not, therefore, to be slipped into any narrow chink or crevice. It seemed also certain that it was not laid on the leaves of any plant, so I assumed it must be laid in moss or rubbish, on the ground. By providing a number of moths with such materials in May, 1891, I succeeded in obtaining a large number of eggs, and in hatching the young larvæ; but I altogether failed to induce them to eat. The egg and young larvæ are, however, so very remarkable—so unlike all our ideas of a Lepidopterous insect—that even so meagre a measure of success was worthy of note. I delayed doing more than mention the result for two reasons. Firstly, because one of our leading—perhaps I ought to say our leading lepidopterist—was pleased to suggest that the beast I had under observation was an *Julus*, or a Crustacean, or some unknown monster, and that repetition was very desirable, with many precautions, to make sure I had *Micropteryx, i.e., Eriocephala*, and nothing else. This advice I was very willing to follow, because not only was it obviously a great compliment to the extraordinary nature of the observation, but as a second reason for delay I hoped to

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be able to make my observations more full, and even perhaps to rear the larvæ.

I accordingly, in June, 1892, secured a good supply of moths and placed them in many different jars. In three of these I gave them nothing but moss, which I had obtained in winter, then cleaned and boiled it, and kept it in a dry condition until it was wetted and given to the moths. Eggs were freely laid in this sterilised moss as in the other jars. I may say that I myself considered this precaution to be absolutely unnecessary, as the eggs laid agreed precisely in size and form with those dissected from the moth—they were seen against the deceased moth that had laid them, they were laid in several different jars, and finally Dr. Wood had, by repeating my procedure, induced moths to lay, and had in fact confirmed all my observations. However, the sterilised moss experiment has been made successfully, and several dozen batches of eggs have been laid, so that there is no room for the most severe scepticism to suggest a doubt.

In 1892 I supplied the moths with flowers of *Ranunculus repens* (common buttercup), and though I believe observations have been made on the mouth-structures and habits of these moths, in which they are in truth very anomalous, as in so many other ways, I may mention my own observations. They use their great claw-like maxillary palpi with sharp knife points to scrape and tear at both the pollen of the stamens and the surface of the petals, in the latter case perhaps collecting fallen pollen. They certainly do something very like eating as regards this pollen, and digest and use it, as would appear from two circumstances: firstly, that very slender moths get very fat and lay many eggs, and, secondly, their dejecta are very abundant. There is obviously room for much detailed observation in this matter, which I did not make, as I wished all my material to be devoted to making sure of eggs, and I had not too much time to give to the subject.

Moths will live in confinement for three weeks if fed in this way and kept damp enough.

They pair readily, and apparently do so more than once. When laying, the female moth creeps down among the moss to a depth of an inch or more, and seems anxious to get to the bottom and lay her eggs on the bottom of the jar, sand or earth. If the stratum is

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too deep for this she will lay them on a spray of the moss, always in little groups, rarely as few as two or three, usually six to ten and even more. I have counted as many as twenty-five. She will often remain and die beside her last batch of eggs. I prepared various jars with mosses of different sorts, and especially several with growing *Mnium*, which I thought might be the proper food, but in this I proved to be mistaken.

About the middle of August, 1892, I found several larvæ of *calthella* about 1·5 mm. in length in a jar in which some moss was growing, but I could see none in my specially prepared pots of *Mnium*, nor indeed in any of the other jars; these larva, though so much larger than the newly-hatched ones, were precisely the same in all respects, so far as I could see without disturbing them. They were kept very wet, the moss dripping and the sand below under water, in consequence of my directions to keep them moist during a temporary absence being misunderstood. The result, however, was decidedly satisfactory, and at the end of September the moss was still growing, and there were two larvæ usually to be seen of a length of about 2 mm. On October 21 I found there were three larvæ in this jar, the two largest measuring with the head retracted 3·5 mm. in length, and therefore probably full grown.

I also found several about 1·3 mm. in length in another jar in which moss was growing, but which had been kept much too dry. In one of the *Mnium* jars there was also one about 1·5 mm. long, seen for the first time close by where a bit of moss (not *Mnium*) was growing. I was on this date successful in making two other observations. One was in seeing one of the larvæ in my best jar actually eating the delicate stem of growing moss, of which a considerable piece of one side had disappeared. The other was due to one of the larvæ having got on to the glass, when not only was it easy to see that it resembled the newly-hatched larvæ as to processes, abdominal legs, etc., but that it also possessed the trefoil sucker. These larvæ seemed to be constantly on the move, at times not to be seen, and when seen always in a fresh place; they walk slowly but steadily, using the abdominal appendages as legs, and often raising the fore part of the body and stretching about as if in search of something.

They are not cannibals, as one walked straight along

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another and neither attempted to injure the other in any way. As judged by the sizes of their heads, there were at least three sizes of larvæ on October 21st, which with the newly-hatched one makes four sizes; but there is little doubt that there would be one or two intermediate sizes between the young larvæ and the smallest seen at this date. The intestinal contents, so far as they are visible through the larva, were in one instance green, in two others brownish. Occasionally a good end view of the larva is seen, and then its angularity (on cross section) is very evident, the spaces between the double rows of processes being hollow and the processes placed on the angles of a flat, raised surface. None of the drawings I have bring out this peculiarity quite satisfactorily.

These larvæ preserve also the long antennæ; these have an elegant curvature, and are placed on the head so as to look, as it moves from side to side, ridiculously like the horns on a Hereford ox—the proportionate length of horn to head being not very different in the two cases.

The moss on which these larvæ thus happened to be reared was named for me by the Rev. A. Ley as *Hypnum prælongum*, a common species. There were also present, though it was doubtful if these were growing, two other common species, *Hypnum tamariscinum* and *swartzii*, and possibly others.

I must admit that I was nearly as much astonished at finding the full-grown larva retain the peculiar structure of the young larva, as I was when I first saw the newly-hatched larva. Having so few and wishing very much to obtain the pupa if possible, I did not sacrifice any of these, for closer examination; but one that died, of 2·5 mm. long, though not quite satisfactory, gave me a good view of the abdominal legs and ball appendages; the head was unfortunately retracted and could not be satisfactorily made out. All these larvæ perished during the winter, and left no trace, except some remains that make a rather poor slide.

In 1893 I prepared eight jars with various mosses and succeeded in having plenty of eggs laid in them, but for some reason or other the young larvæ, which hatched abundantly, appeared to have all perished, until I was pleased and surprised early in November to observe two full-grown larvæ in one of the jars.

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In January, 1894, I observed some threads of *Isaria* in this jar, and found they proceeded from what turned out to be a cocoon of *calthella*, with a dead full-grown larva curled up inside; the cocoon was fairly tough, of yellowish silk and with scraps of moss coating it, ovoid, 3 mm. long and 1·5 broad. The contained larva was somewhat damaged by the fungus and in removing it from the cocoon. The abdominal legs are all present, but the structure seems a little more modified, either really or by the *Isaria*, than in the two-third grown larva already referred to. The antennæ are very long, the first long joint being very long, the second reduced as compared with younger larvæ. The ball appendages are proportionally rather smaller. The dots in the sulci between are now large, round, smooth, disc-like plates, comparing markedly with the rough surrounding skin, and having a central pigment spot.

The ova are spherical, 0·46 mm. in diameter, of *calthella* almost white; of *seppella* 0·41 mm., a very little smaller and distinctly yellow. They have a snowy, mealy look, owing to a provision of a close coating of minute rods standing vertically on the surface of the egg and often tipped with a small bulb (of fluid?); whether these are adpressed to the surface of the egg when laid, or whether they afterwards develop in some way, I do not know, but I think the latter. Their function would appear to be to protect the egg from too close contact with the possibly very wet surface on which it lies.

The young larva is difficult to examine owing to its delicacy, to its retracting its head when disturbed, and to its rapid shrivelling by desiccation, when removed from its natural habitat in damp moss.

The peculiarities of its form and structure may be stated to be its angular outline, the possession of a number of remarkable appendages to each segment, of eight pairs of abdominal legs of unusual structure, and of an oval sucker; that the antennæ are remarkably long for a lepidopterous larva, and that the head is retractile, so far, that it may occupy the interior of the 2nd thoracic segment.

The larva does not appear to alter these characters during its growth to maturity. The antennæ of the adult

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larva are not perhaps proportionately so long, and the abdominal legs have shorter and thicker bases.

The description, therefore, and figures of the larvæ, though chiefly taken from preserved specimens of the young larva, are not probably far out, if applied even to the full-grown one.

The larva is thick and short and fairly cylindrical, apart from its angular section, and tapers very little, terminating rather abruptly at either end, especially when sulky and with retracted head. The angular outline is due to eight rows of peculiar appendages, so disposed as to form two subdorsal rows and two lateral rows on either side, each double row arising from the angles of a raised ridge, and the intervening spaces being rather hollowed. The general surface is raised in ridges, or rather marked by sulci that are chiefly transverse in direction, but communicate with each other to form a network, and in places forming a beautiful rosetted pattern.

The general result is a division of each segment into five subsegments, the balls or appendages are on the third of these. The fourth and fifth, in the centre of the dorsum, and again in the centre of space between the subdorsal and lateral pairs of ridges, are united into one by a circular area, in the centre of which is a dot or spot.

This description applies to the 2nd and 3rd thoracic and 1st to 7th abdominal segments. The 1st thoracic segment has two transverse rows of ball appendages, with six in the first row and four in the second.

On the 8th abdominal segment the appendages are similarly in two rows, but deficient in number, there being only eight altogether; whilst on the 9th segment are only six.

These appendages on 8 and 9 abdominal are longer, larger, and more club-shaped, and project backwards from their points of attachment; those on the other segments shorter and more rounded, are directed forward—those on the 1st thoracic are, however, similarly a little larger and longer than the others.

These appendages arise from special ball-like points, encircled by a special area, and are globular in form, or in some cases nearly pyriform, with a definite neck or stalk; they are dotted as though with spiculæ in a rect-

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angular pattern, and appear to have some internal ribbing or skeleton, which remains stiff in a mounted specimen, whilst the surface loses its plumpness and shrivels. The abdominal legs are eight pairs on the first eight abdominal segments, arranged so as to suggest that this double row is a modification of the double rows of appendages on the upper surface.

These legs are, however, of a very different structure from the balls of the upper surface, and also from the true legs on the thoracic segments.

They consist of a long stem or shaft with, both towards its base and apex, some doubtful spicular projections; this shaft is apparently cylindrical, and contains a body which is either a vessel or tube, or a tendon to the terminal claw. The shaft arises from a conical base, to which it is not distinctly jointed, but is rather continuous with it.

The terminal piece is a very distinct and separate structure, in general outline much like the terminal joint or claw of a thoracic leg, but with the sharp apex rounded off; the convexity is directed forwards (not inwards). It is of homogeneous semi-transparent texture, but marked by oblique lines, which suggest, whether correctly or not I cannot say, that the surface between them is raised in rounded ridges, which pass round the anterior and posterior edges and make it look like a conventional cornucopia. In preserved specimens the shafts of these legs seem laterally compressed.

Another structure is a sucker on the under surface of the 9th and 10th abdominal segments, its form is trefoil with one leaf forwards, or possibly only on 10th, the 9th being very narrow in front of it.

This sucker, on a lepidopterous larva, is of course very unusual, and is a further point of relationship to Limacodids. The 14th segment carries dorsally two hairs. The true legs, besides the base, which is a little full and raised, consist of three joints, and much resemble the thoracic legs of an ordinary lepidopterous larva. The first large joint has two spurs on its inner margin, about the middle, and two or three hairs on the same zone, laterally and dorsally; the second more slender joint is rather longer, and narrows about the middle, where there is a spur or bristle on its inner margin; on the outer side, at its extremity, is an indication of a bristle or two,

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but no definite appendage. The last joint is again rather shorter, and terminates in a sharp point.

The head is rather longer than broad, and narrows a little forwards; there are two strong mandibles, with four brown teeth. The antennæ are very long, about equal in length to the transverse diameter of the head; there are two short thick basal segments, as to the first of which I am not very sure whether it is a true segment or a basal projection; there are two long segments about equal in length, and a nearly as long terminal joint, which is little more than a seta in thickness. Two pairs of palpi are also visible—two and three-jointed, apparently those usual in lepidopterous larvæ, but I have not defined their relations. There is also a central point (spinneret?).

I have also one observation bearing on the pupa. A moth that I placed on a slide was found to have a defective antenna, and was accompanied by the head-piece of the pupa case, which was of the "Incompletæ" or "Micro" type, that is, consisted of the covering of antennæ, head, and head-appendages in one piece. This observation renders tolerably certain what was antecedently probable, that the pupa is of "micro" type, with 3rd and following abdominal segments free.

The pupal structure of *Zygæna* and of *Limacodes* showed them to be micros, of a rather early type, whilst their ova also presented peculiarities nowhere to be met with among macros, and though not at all resembling closely those of *Eriocephala*, not at all unlike some Adelids.

The larvæ of these two groups, however, present very wide differences from other micros.

The only other micro-larva having similar form, and the habit of not mining or feeding internally, or under a web, was curiously that of *Eriocephala*. Unfortunately, though the pupa of *Zygæna* and *Limacodes* are of nearly the same micro-type, and that a low one, and *Eriocephala* must also have a pupa of low micro-type, I have, after trying to obtain it for three years, failed to do so. It cannot be taken for granted that it is of the same type as they are. We are therefore deprived, for the present, of the light that would throw on these relationships. It occurred to me, however, that if this relationship was real, and not a mere resemblance, some other points

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of similarity of structure and habits would be discoverable.

The first point that occurred to me was that traces of abdominal legs, like those of *Eriocephala*, might perhaps occur in newly-hatched larvæ of some species of *Zygæna* or *Limacodes*. So far, I have failed to detect such a structure, but find it recorded that the larva of *Lagoa crispata* possesses additional abdominal legs. I have not yet succeeded in obtaining eggs of this species. The pupa is unquestionably *Limacodid*, though Packard calls it a *Liparid*. Though many systematists consider Liparids and Limacodids to inosculate, the pupæ prove them to be about as far apart, phylogenetically, as they well can be. I succeeded in obtaining eggs and young larvæ of *Parasa chloris*, and in rearing one larva; but though this is a most curious and interesting larva, it did not present any extra abdominal legs. It confirmed, however, the observations on *Limacodes testudo*, which afforded me some very curious facts, and some very unexpected confirmation of the suspected relationship to *Eriocephala*.

Limacodes has suckers to the first eight abdominal segments, though the first and last of these are poorly developed; these suckers are probably homologous with prolegs, and also with the eight pairs of abdominal legs of *Eriocephala*.

When the larva of *Limacodes testudo* has completed its development within the eggshell, which is very easy to watch, owing to its transparency, flatness, and the facility with which the moth can be induced to lay them on glass, it is free from any spines or processes, but at the period of hatching certain long spines are rapidly developed; of these there are at least four on each segment, arranged as a dorsal and lateral series on either side. The ordinary tubercles can be detected as faint dots, but these spines are quite independent of the ordinary tubercles, and differently placed, and correspond in position to no larval processes I am aware of, except those of *Eriocephala*.

In *testudo* the dorsal series on one side, though consisting of one spine on each segment, has them placed as though they were the double rows of *Eriocephala*, with alternate spines omitted, *i.e.*, the inner spine is wanting on the first abdominal segment, the outer one on the

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second, and so on alternately; laterally the spines appear to belong to the lower row of the lateral series of *Eriocephala*, but the upper row is represented on the thorax by two spines.

A further point of resemblance in these spines to those of *Eriocephala*, is in their peculiar spiculate apex, which reminds one much of the peculiar stellate spiculæ of the knobs of *Eriocephala*.

The rapid development of these spines occurs in this way: In the unhatched larva a circular mark exists at the site of each spine, and is the summit of a cylindrical body deeply imbedded in the larval substance. This body is, in fact, the spine, of which the upper third appears to be already stiff and solid, with its apex at the surface ready to emerge, whilst the lower two-thirds form a soft invaginated sheath surrounding this upper part. As the spine emerges, when half of the soft portion has emerged there appears upon it a spur, and when the emergence is complete, and, in fact, at any time, a distinct joint is visible at the base of the upper portion. The soft portion appears very rapidly to become hard.

I had the good fortune to observe this emergence take place in many instances, and have preserved specimens at all the stages.

These spines are in length about equal in length to the diameter of the larva, and are divisible into three portions. The basal is rather thick and smooth, and terminates at the lateral spur. The middle portion is continuous with the basal, and is structurally the same—only narrower—and is also quite smooth. The terminal third is separated from the middle portion by a joint, or transverse line of union, and has a series of minute points or teeth, apparently arranged in a somewhat spiral manner along its shaft, and terminates at the apex in a slight enlargement and a coronet of angular points, six to nine in number. The lateral points are difficult to see except where taken in profile, though I have some preparations showing them to be really rather numerous and spirally arranged. Like the structural framework of the knobs of *Eriocephala* they are less evident during life.

The inner structure of these spines has all the appearance of consisting of a separate included tube running the whole length, and having a branch to the lateral spur.

On the first moult these spines disappear, and are

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replaced by straight spines, that is, they have a smooth outline, and taper continuously from base to apex. They have, however, a joint about $\frac{2}{3}$th of their length from the base, the apex looking harder, browner, and more solid, and they appear to have a central tube. I need not allude to their apparent origin from deep tissues, and the skin looking like a thick coating of glass, through which they come, as this is, I think, a well-known peculiarity of these larvæ (as also of many Lycænids).

But the dorsal set of spines are now double, that is, the double row, of which the alternate members were wanting in the larva of the first stage, is now complete, and they remain so even in the adult larva, though they are now merely prominences, and not spines. In the second and third stages there are, especially in the thoracic regions round the bases of these spines, very minute spines, apparently of a structure very similar to the last joint of the spines in first stage.

The spinneret in this larva is remarkable up till the penultimate stage, in being not a pointed organ, but flattened out like a fish's tail, and the silk it disposes on the leaves for the larva to walk upon, is not a thread, but a very thin ribbon.

This larva has other very interesting peculiarities, most of which are, I imagine, well known. These I need not touch on, indeed all I am at present interested to touch on is the remarkable disposition and structure of these spines in the newly-hatched larva, parallel with nothing I know of in any other family than the similar arrangements in *Eriocephala*.

Prof. A. S. Packard has some excellent observations on spines of *Limacodids*, but on none, so far as I know, that quite parallel these in structure; and he does not, I think, refer to their disposition in the newly-hatched larva as similar to that I find in *testudo*.

He figures, however, the young larva of *Lithodia fasciola*, which seems to be very like that of *testudo*, though less well-developed, and for this reason, want of sufficient material, and insufficient amplification, appears not to have noted any of the points I have here drawn attention to.

Among many figures he gives of *Ceratocampid* and other spines, and similar figures elsewhere, and amongst my own observations, there are abundant instances of an

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inflated or elongated base, carrying an appendage articulated to it, or several such; but these appendages are always simple hair-like or spinous, just as they are in *testudo* after the first skin.

In the case of *Zygæna* I have failed to detect any structures in the young larvæ I have examined at all parallel to these, and must still rely on the structure of the egg, the form and habit of the larva, and the very primitive form of the pupa, for its alliance with this section.

I have examined the eggs of *Limacodes testudo*, *Heterogenea asellus*, and *Parasa chloris*. They are all flat, oval, colourless, transparent, with lozenge-shaped network of cell-structure of the shell, easily seen if examined in suitable light and with moderate magnifying power. Such eggs occur amongst the Micros and in some Pyrales. Nothing like them is anywhere met with, so far as I know, amongst Macros.

The pupa also is of evident Micro type. The wing and appendage cases are not attached to abdominal segments beyond the second. They are not difficult to detach, in some species, from each other. The *maxillæ* are small, but are prolonged outwards, and after passing through a narrow neck terminate in a (sometimes rather twisted) club between the eyes, antennæ, and legs. This represents the maxillary palpus, which nowhere in Macros has any such development.

Then movement exists in the 3rd and 4th abdominal segments and in the ♂ pupa, also in the 7th. Further, the larva lies unchanged in the cocoon all winter, and moults to pupa in the spring, and the pupa escapes from the cocoon for emergence.

These characters apply to the following species which I had alive last spring: *Limacodes testudo*, *Parasa chloris*, *Limacodes scapha*, *Heterogenea asellus*, *Empretia stimulea*, and *Lagoa crispata*.

I do not know that a detailed description of each would carry us much further. They vary in the proportion of parts, the extent of toothed armature on the back of the abdominal segments, and other sculpture. Other features that do not so much interest us in the present connection are the possession of a beak between the eyes (for rupturing the cocoon); the projection backwards of the meso-scutellum, so that its sharp apex almost

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reaches the 2nd abdominal segment; a very remarkable structure that exists in other families, but nowhere else so well developed as here, and which I have called an eye-flange. Where, in most pupæ, the eye abuts against the antennæ, it is here rather separate, and a flat flange-like margin, with sharp edge, and in some marked with radiating lines, surrounds the eye without quite joining the antenna.

In *Lagoa crispata* the antennæ of the male are a very marked feature of the pupa. Unfortunately, I had only this one pupa, and so failed to obtain eggs. The cocoon is very like the others except in one very important point, it has a practicable lid.

In *Zygæna* the egg is of an ovoid form, with a delicate colourless and apparently structureless shell. The contents divide into two portions—a yellow at one end, and a nearly colourless at the other, and till one is familiar with them one is persuaded they are addled at least.

The pupa (I have examined *filipendulæ, loniceræ, trifolii, exulans*) is very different from that of *Limacodes* in form and colour, but in the most essential points the number of free segments, the looseness of attachment of the appendages, and in the dehiscense, it is practically identical. The maxillary palpus is nearly or quite obsolete, and in some other points the appendage-cases have a structure differing from *Limacodes*. The dorsal head-cover is still well-developed.

I may note that *Syntomis*, placed in *Zygænidæ* or left close by in *Syntomidæ*, not only has, as has been often remarked, a very Arctioid larva, but, as is demonstrated by the pupa, is really an *Arctia*, with no affinities whatever with *Zygæna*. The ovum is also an *Arctia* ovum, not indeed very far from *Caja*, but differing from *Zygæna toto cælo*.

I am indebted to Dr. W. G. Clements for the privilege of examining a cocoon and pupa of *Euchromia fulvida*, a species also credited with Zygænid affinities. The pupa in no way resembles *Zygæna*, but though very delicate and transparent, affords no characters that I can certainly seize to separate it, much more than generically, from *Lubricipeda*.

It presented a curious Arctioid peculiarity, viz., the adherence of the cocoon to the pupa. *Caja* cocoon, for

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example, can hardly be touched without the cocoon adhering to the pupa, as if they had been wetted.

These two instances seem as sufficient as a thousand, to illustrate that *Zygæna* has been placed among Arctiid families, on the strength of some analogies of the imagines, which cannot be homologies, as they do not affect the earlier stages.

Explanation of Plates VI. & VII.

PLATE VI.

Larva of *Eriocephala calthella.*

Fig. 1. Larva first skin, slightly grown, dorsal view, × 100 diam.
2. Larva first skin, newly hatched, dorsal view, × 50 diam.
3. „ „ lateral view, × 50 diam.
4. Antenna, × 600 diam.
5. Abdominal leg, × 900 diam.
6. „ „ × 1200 diam.
7, 8. Ball appendages, × about 900 diam.

PLATE VII.

Eriocephala calthella.

Fig. 9. Ball appendage and rosetted structure of skin, half-grown larva, × about 300 diam.
10. Thoracic leg, × about 200 diam.
11. Abdominal leg of larva, two-thirds grown, × about 300 diam.
12. Ova in moss, × 30 diam., the upper ovum near hatching.
13. Form of sucker, ventral aspect of 13th and 14th segments.

Larva of *Limacodes testudo.*

Fig. 14. Newly-hatched larva, dorsal view, before emergence of spines, × 100 diam.
15. „ „ lateral view, × 100 diam.
16, 17, 18. Stages in emergence of spines, × 100 diam.
19. Terminal portion of spine, × 150 diam.
20. Thoracic leg, × 150 diam.

Fig. 1 from drawing by Mr. A. Hammond, F.L.S., from a living larva.
Figs. 2 and 3 from drawings by Mr. H. Knight, from living larva.
Figs. 5, 8, 9, 14, 15, 16, 17, 18, 20 from drawings by Mr. E. Wilson, from preserved specimens.
The others from my sketches.

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XI. *On the* Tenebrionidæ *collected in Australia and Tasmania by* Mr. James J. Walker, R.N., F.L.S., *during the voyage of H.M.S. "Penguin," with descriptions of new genera and species.* By George C. Champion, F.Z.S.

[Read Feb. 28th, 1894.]

Plate VIII.

It is proposed in this paper, which is in continuation of one contributed by Mr. Gahan on the Longicornia (Trans. Ent. Soc. Lond. 1893, pp. 165—197), to give a list of the Tenebrionidæ collected in Australia and Tasmania by Mr. J. J. Walker in the years 1890—1, during the voyage of H.M. Surveying-Ship "Penguin," reserving for the present the Cistelidæ, Melandryidæ, Anthicidæ, and the remaining families of the Heteromerous series, and also the Tenebrionidæ subsequently obtained by him in other places. The material examined has been forwarded by Mr. Walker partly to myself and partly to the British Museum, but the whole of the specimens collected have been examined. Some few species are represented in the Museum-set only (mostly single examples), and these are specially noted below. Five new genera and thirty-three new species are described out of a total of 110 species. All the new genera and thirteen of the new species are from Tasmania, the remaining species being from North-west or West Australia. Three genera have not hitherto been recorded from the Australian continent, viz., *Crypticus*, *Corticeus*, and *Palorus*. *Lyphia* (= *Lindia*, Blackb.) is new to the Tasmanian fauna. Judging from the collection made by Mr. Walker, there is still much to be done in Tasmania, not only in the Tenebrionidæ, but in the other families of the Coleoptera. I am indebted to the Rev. T. Blackburn for a good deal of assistance in the preparation of this paper, for the purposes of which I have carefully studied the collections of Pascoe and F. Bates—both very rich in Australian species, and containing a large number of Australian types,—and also the Hope Collection at Oxford.

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Cotulades.

Cotulades, Pascoe, Journ. Ent., i., p. 119 (1860).

Cotulades fascicularis.

Cotulades fascicularis, Pascoe, Journ. Ent., i., p. 119, t. 7, fig. 5.

Hab. Tasmania—Hobart.

This insect is closely allied to *C.* (*Tagenia*) *leucospila*, Hope, the type of which I have examined, but differs from it in having the punctures of the elytral series finer and more closely placed, the thorax depressed in the middle, etc. Under bark (Walker).

Docalis.

Docalis, Pascoe, Journ. Ent., i., p. 121 (1860).

Docalis funerosus.

Tagenia funerosa, Hope, Trans. Ent. Soc. Lond. 1845, p. 107.

Docalis exoletus, Pascoe, Journ. Ent., i., p. 121, t. 8, fig. 7 (1860).

Docalis degener, Pascoe, *loc. cit.*, p. 122.

Hab. Tasmania—New Norfolk, Launceston, Franklin, Hobart.

Found in plenty by Mr. Walker, under loose bark of *Eucalyptus*. Fresh specimens have numerous fascicles of white or brownish-white scales on the elytra, these not being apparent in worn or dirty examples. The insect varies greatly in size. I have examined the type of *Tagenia funerosa*, Hope (which is completely abraded), and also that of *D. exoletus*, Pascoe. *D. degener* is, apparently, missing from the Pascoe collection. In the Catalogue of Gemminger and Harold, and also in that of Masters, *T. funerosa*, Hope, is incorrectly placed under *Cotulades*.

Elascus.

Elascus, Pascoe, Journ. Ent., i., p. 119 (1860).

The species of this genus have wholly the facies of

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certain Colydiidæ, *i.e.*, of *Corticus* and *Sarrotrium*. They are found under bark of felled *Eucalyptus* trees.

Elascus crassicornis.

Elascus crassicornis, Pascoe, Journ. Ent., i., p. 120, t. 7, fig. 7.

Hab. Tasmania—New Norfolk.

Elascus lunatus.

Elascus lunatus, Pascoe, *loc. cit.*, t. 7, fig. 8.

Hab. Tasmania—Launceston and Hobart.

Three specimens, agreeing with the type in the Pascoe Collection.

EDYLIUS, n. gen.

Mentum strongly transverse, trapezoidal, carinate down the middle; mandibles bifid at the tip; last joint of the maxillary palpi oblong-ovate, that of the labial pair similarly shaped; maxillæ with the inner and outer lobes coarsely ciliated; labrum moderately prominent, emarginate in front; head large and broad, deeply sunk into the prothorax, arcuate-emarginate in front, the antennary orbits rather broadly expanded, parallel behind, and extending outwardly nearly as far as the eyes, the latter small, strongly transverse, and almost entire, the epistoma not clearly defined; antennæ not reaching the base of the prothorax, joint 3 twice as long as 2, shorter than 4, 4 and 5 equal, 6 a little shorter and broader, 7—11 widened, 7 as broad as long, 8—10 strongly transverse; prothorax large, transverse, convex, broadly, horizontally explanate at the sides, with very prominent angles, the anterior ones subangularly produced in front, and nearly meeting the antennary orbits, the base feebly bisinuate; scutellum transversely triangular, moderately large; elytra about twice as long, and of about the same width, as the prothorax, connate, broad oval, rounded at the sides in front, acutely margined, the humeri obtuse, declivous, not meeting the hind angles of the prothorax; prosternum convex, rather broad, declivous behind, margined on either side between the coxæ; middle coxal cavities widely open externally, the trochantin large; hind coxæ widely separated, the intercoxal process broadly rounded at the apex; epipleuræ entire, broad at the base, gradually narrowing to the apex; third and fourth ventral segments with coriaceous hind margin; legs elongate; anterior tibiæ flattened and dilated, strongly produced at their outer apical

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angle; intermediate and hind tibiæ slender, asperate, setose, the hind pair slightly bowed inwards in both sexes; tarsi sparsely clothed with long bristly hairs beneath, the two hinder pairs rather elongate, the first joint of the hind pair nearly as long as 3 and 4 united, the anterior pair with the basal joints a little stouter and furnished with a brush of long silky hairs beneath in the male; body oblong-oval, rather broad, apterous, sparsely clothed with long, appressed, silky hairs, the prothorax and elytra sparsely ciliate at the sides.

This genus is proposed for a single species which appears to be not uncommon in Tasmania. It belongs to the "Pedinides" of Lacordaire. *E. canescens* has much the facies of a small *Asida*.

Edylius canescens, n. sp. (Plate VIII., figs. 5, 5*a*, *b*, ♂.)

Oblong-oval, rather broad, convex, ferruginous or obscure ferruginous, slightly shining; above and beneath sparsely clothed with long, appressed, whitish, silky hairs, the pubescence denser at the sides of the prothorax and on the elytra, and on the pro- and epipleuræ forming ciliæ, the four hinder tibiæ also with long hairs on their inner face. Head densely, rather coarsely punctate; prothorax strongly transverse, much broader at the base than at the apex, the sides parallel behind, arcuately converging from about the basal third, the apex (viewed from above) very broadly truncate-emarginate, the base feebly bisinuate, the hind angles obtusely rectangular and very prominent, the anterior angles strongly produced in front, the surface densely, moderately finely punctate, the punctures more scattered on the middle of the disc; elytra confusedly punctured throughout, the punctures more diffuse, and much finer and shallower than those on the prothorax; beneath shining, closely and rather coarsely punctate. Length 7½—8½, breadth 4—4⅔ mm. (♂ ♀).

Hab. Tasmania—Hobart.

Many specimens, found buried in the sand at roots of maritime plants, a few feet above high-water mark.

Cestrinus.

Isopteron, Hope, Col. Man., iii., p. 112 (1840).
Cestrinus, Erichson, in Wiegmann's Archiv, 1842, i., p. 172.
Mitua, Hope, Trans. Ent. Soc. Lond., v., p. 56.

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I have examined the type of *Isopteron opatroides*, Hope, and it is inseparable from *Cestrinus*, Er. *Opatrum piceitarse*, Hope, also belongs to the same genus. His definition, "Tibiæ anteriores dentatæ," is incorrect and misleading: it, perhaps, refers to the subangular dilatation of the anterior tibiæ beneath—a male character of some of the members of the genus. As Hope did not describe his typical species of *Isopteron* till 1842 (and then under a different name to the one mentioned in the "Manual"), it is not advisable to change Erichson's name. This genus really belongs to the group "Pedinides," and it should be placed near *Blapstinus*.

Cestrinus trivialis.

Cestrinus trivialis, Er., *loc. cit.*, p. 173; Lacord. Gen. Col., Atlas, t. 53, fig. 6.
Cestrinus longus, Blanch., in Dumont d'Urville's Voyage au Pole Sud, iv., Ins., p. 156, t. 40, fig. 14.

Hab. Tasmania—Hobart, Launceston, George's Bay.

Originally described from Tasmania. The male has the anterior tibiæ abruptly widened on the inner side from about the middle to the apex, and the basal joints of the anterior tarsi a little thickened. *Isopteron opatroides*, Hope, is closely allied to this insect, but differs from it in having ferruginous antennæ and the elytral interstices granular. *Opatrum piceitarse*, Hope, is also very near *C. trivialis*, but it has the sides of the thorax less sinuous behind.

Cestrinus aversus.

Cestrinus aversus, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 278.
Cestrinus posticus, Pasc., *loc. cit.*

Hab. Tasmania—Hobart.

Numerous specimens; some with fully-developed, others with rudimentary wings. The anterior tibiæ are simple in the male. This and the preceding species occurred under stones not far from the sea-shore (Walker).

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Cestrinus punctatissimus.

Cestrinus punctatissimus, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 278.

Hab. Tasmania—Hobart.

One example.

Cestrinus brevis, sp. n.

♀. Oblong ovate, moderately convex, opaque, pitchy-black; the upper surface thickly clothed with rather coarse appressed brown hairs, amongst which are scattered yellowish-cinereous hairs; the antennæ ferruginous; the legs fusco-ferruginous, the tarsi ferruginous. Head short, deeply sunk into the prothorax, densely, rugosely punctured, the antennary orbits extending about halfway across the eyes; the epistoma short and limited behind by a deep transverse groove, feebly arcuate-emarginate in front; antennæ about reaching the base of the prothorax; prothorax transverse, arcuate-emarginate in front, truncate at the base, widest at the middle, the sides obliquely converging thence to the apex, and sinuously converging behind, the hind angles rectangular, the anterior angles sharp and prominent, the surface coarsely, rugosely punctured, the interstices very densely, minutely punctate; elytra a little wider than, and about two-and-a-half times the length of, the prothorax, with rows of rather fine, deep, subapproximate punctures placed in shallow grooves, the interstices feebly raised, very densely minutely punctured, and with fine scattered granules; anterior tibiæ slightly curved inwards, rather slender, the outer apical angle obtuse; anterior tarsi simple. Length 6¼, breadth 2⅔ mm.

Hab. W. Australia—Fremantle and Darlington.

Two specimens, apparently both females. Less elongate than *C. trivialis*, Er.; the head much shorter, the epistoma especially; the thorax more transverse, and more narrowed in front and behind; the seriate punctures on the elytra less coarse, the interstices more sparsely and more finely granulated; the pubescence of the upper surface not unicolorous. *C. brevis* is less elongate than any of the other species of the genus known to me. I have received a specimen of a closely-allied undescribed form from the Rev. T. Blackburn.

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Cædius.

Cædius, Lacordaire, Gen. Col., v., p. 261 (1859), (*nec* Blanchard).

(?) *Plesioderes*, Mulsant et Rey, Mém. Acad. Lyon, x., p. 34 (1860).

Blanchard (Hist. des Ins., ii., p. 13) gives as characters for *Cædius*:—"Antennæ with the last five joints broad and compressed; tibiæ slightly widened, not crenulated; body oval." It is clear, therefore, that he had some other genus in view. Lacordaire's description was taken from *Opatrum sphæroides*, Hope. *Plesioderes* is probably distinct from *Cædius*, Lac.

Cædius sphæroides.

Opatrum sphæroides, Hope, Proc. Ent. Soc. Lond., 1842, p. 77; Trans. Ent. Soc. Lond., 1845, p. 107.
Cædius sphæroides, Lacord., Gen. Col., v., p. 262.

Hab. W. Australia—Fremantle, Condillac I., Troughton I., Jones I.

In the typical examples (2) of *Opatrum sphæroides*, Hope, in the Oxford Museum, the elytra each appear, at first sight, to have two rows of prominent rounded elevations, the inner one extending on to the base of the thorax: these elevations, however, are partly formed by dense fascicles of scaly hairs, and are not always distinct. Found rather commonly under stones, near the sea-shore (Walker).

Pseudocædius.

Pseudocædius, Blackburn, Trans. R. Soc. S. Austr., xiii., p. 9 (1890).

Pseudocædius squamosus.

Pseudocædius squamosus, Blackb., *loc. cit.*

Hab. N. W. Australia—Roebuck Bay.

Found in plenty by Mr. Walker, at roots of grass on the sea-shore. Mr. Blackburn's specimens were obtained from the same locality.

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Cædiomorpha.

Cædiomorpha, Blackburn, Trans. R. Soc. S. Austr., x., p. 272 (1888).

Cædiomorpha australis.

Cædiomorpha australis, Blackb., *loc. cit.*

Hab. W. Australia—E. Wallaby I. in the Houtmann's Abrolhos Group, Fremantle, and Cape Leeuwin.

Many specimens, found by Mr. Walker on sandy seashores, at roots of bent grass. This species is said to be widely distributed in South Australia.

Prionotus.

Prionotus, Mulsant et Rey, Mém. Acad. Lyon, ix., p. 150 (1859).

Achora, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 279 (1869).

Prionotus serricollis.

Asida serricollis, Hope, Proc. Ent. Soc. Lond., 1842, p. 77; Trans. Ent. Soc. Lond., 1845, p. 108.

Opatrum denticolle, Blanch., in Dumont d'Urville's Voyage au Pole Sud, iv., Ins., p. 154, t. 10, fig. 13 (1853).

Prionotus denticollis, Muls. et Rey, Mém. Acad. Lyon, ix., p. 151.

Hab. Tasmania—Hobart and Launceston.

I have examined the type of *Asida serricollis*, Hope, from Adelaide; it does not differ from the Tasmanian insect. The lateral thoracic teeth are almost or quite obsolete in some specimens. Under stones and logs in dry places, common (Walker).

Opatrum.

Opatrum, Fabricius, Syst. Ent., p. 76 (1775) (part.).

This genus is apparently well-represented in the northern parts of Australia, whence very few species, however, have been described as yet. Of the five species received from Mr. Walker from that continent, four are apparently new. *Opatrum* seems to be replaced in Tasmania by the genus *Cestrinus*. It may be noted here that the descriptions of *Opatrum seriatum* and *O. australe*, Boisd., are perfectly unintelligible.

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Opatrum villigerum.

Opatrum villiger, Blanch., in Dumont d'Urville's Voyage au Pole Sud, iv., Ins., p. 154, t. 10, fig. 10.

Hab. S. Australia—Port Adelaide.

Two examples, perhaps belonging to this species, the original specimens of which were obtained at Raffles Bay.

Opatrum torridum, n. sp.

Rather elongate, subparallel, moderately convex, black, opaque, sparsely pubescent, and usually thickly covered with an adherent earthy coating. Head broad, thickly punctured, the epistoma very deeply emarginate, the sides of the front broadly, obliquely, subangularly dilated, and extending more than half way across the eyes, the latter rather large ; antennæ almost extending to the base of the prothorax, the penultimate joints transverse ; prothorax strongly transverse, not very convex, moderately explanate at the sides, broadly and deeply emarginate in front, strongly bisinuate at the base, which is also feebly emarginate in the middle, the sides moderately rounded, obliquely converging in front, and slightly sinuous behind, the anterior angles sharp and prominent, the hind angles sharply rectangular, the surface thickly and finely punctured, the interspaces densely, very minutely punctate and also finely granulate ; elytra about four times as long as the prothorax, and a little wider than it, subparallel in their basal half, and with subrectangular somewhat prominent humeri, moderately deeply, rather finely punctate-striate, the interstices almost flat, densely, very minutely punctured and also finely granulate ; anterior tibiæ gradually widening outwardly, their outer apical angle sharp ; anterior tarsi sparsely clothed with rather coarse hairs beneath ; body fully winged. Length 8¼—8¾, breadth 3½—4 mm.

Hab. N. W. Australia—Adelaide River.

Two examples, apparently male and female. This species (of which I have also received a specimen from the Rev. T. Blackburn) closely resembles some of the common European forms, such as *O.* (*Gonocephalum*) *rusticum*, Oliv. As is frequently the case in this genus, the sculpture is almost completely hidden by an adherent earthy coating; when this is removed, the minute punctuation and the granular elevations of the interstices of the elytra are easily seen.

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Opatrum walkeri, n. sp.

Moderately broad, subparallel, not very convex, black or brownish-black, opaque, clothed with a short, fine, decumbent, greyish pubescence, which is usually hidden by an adherent earthy coating. Head rather broad, deeply sunk into the prothorax, the sides of the front broadly, obliquely, subangularly dilated (forming almost a continuous outline with the sides of the prothorax) and extending far beyond the eyes laterally, and about half-way across them posteriorly, the epistoma deeply triangularly emarginate in front and limited behind by a fine groove, the surface densely, roughly punctured; antennæ short, not reaching the base of the prothorax, joints 8–10 strongly transverse; prothorax twice as broad as long, feebly convex, broadly explanate at the sides, widest at the middle, broadly and deeply emarginate in front and bisinuate at the base, the sides strongly rounded at the middle, rather obliquely converging in front, and constricted behind, the hind angles acute, the anterior angles rather sharp, the surface densely, rugosely punctured, the interspaces finely granulate and very minutely punctate, the disc with traces of a fine median groove; elytra about three and a half times the length of, and at the base a little wider than, the prothorax, subparallel in their basal half, trisinuate at the base, with prominent rectangular humeri, closely and moderately coarsely punctate-striate, the interstices densely, very minutely punctate, granulate, and rather convex, the third, fifth, and seventh a little more raised than the others; the legs and under surface densely, roughly punctate and pubescent; anterior tibiæ gradually widened to the acute outer angles; anterior tarsi sparsely clothed with rather coarse hairs beneath; wings fully developed; the ventral segments 1–3 depressed along the middle in the male. Length 7¾—9¼, breadth 3½—4½ mm.

Hab. N. W. Australia—Adelaide River.

Found in plenty by Mr. Walker. This species may chiefly be recognized by the explanate rounded margins of the prothorax and the rather convex elytral interstices, the third, fifth, and seventh a little more raised than the others. In dirty specimens the minute dense punctuation of the surface is completely hidden, and the granulations are more distinct. *O. walkeri* is closely allied to *O. moluccanum*, Blanch., numerous specimens of which were obtained by Mr. Walker at the Islands of Amboyna and Damma.

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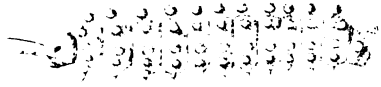

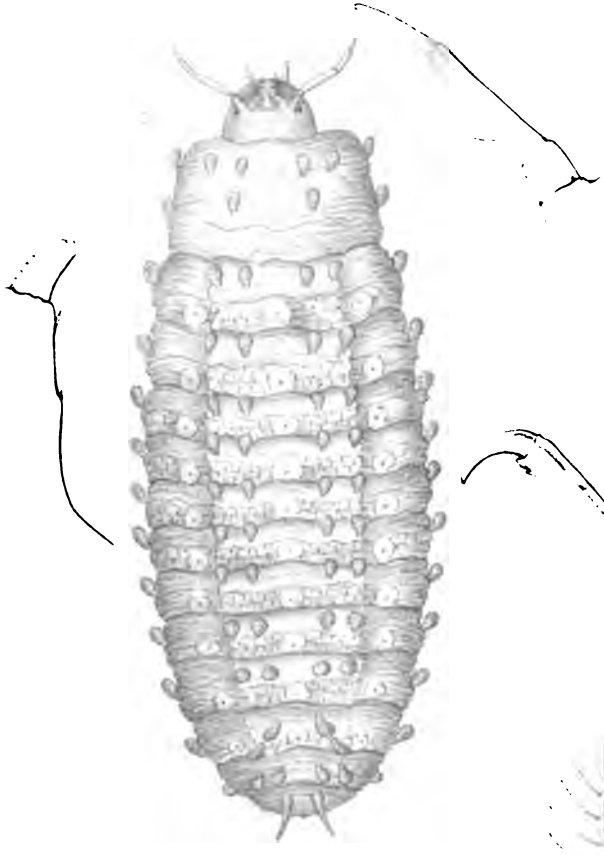

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Opatrum dispersum, n. sp.

Moderately elongate, subparallel, not very convex, rather narrow, pitchy-brown, opaque, somewhat sparsely clothed with moderately long, appressed yellowish-cinereous hairs, which on the elytra form a very irregular treble series on each of the interstices. Head somewhat exserted, densely punctured, the epistoma very deeply emarginate and confounded with the front, the eyes rather large and completely divided, the orbits narrow and rounded off behind; antennæ scarcely reaching the base of the prothorax, joints 8—10 transverse; prothorax convex, twice as broad as long, rather feebly arcuate-emarginate in front (subtruncate if viewed from above), strongly bisinuate at the base, moderately rounded at the sides, widest a little before the base, the hind angles subrectangular, the anterior angles rather obtuse, the surface densely, rather finely punctured; elytra about four times the length of, and scarcely wider than, the prothorax, subparallel in their basal half, finely and lightly punctate-striate, the interstices almost flat, finely and closely punctured, the punctures slightly muricate; tarsi thickly clothed with long silky hairs beneath, the anterior pair simple; anterior tibiæ slender, gradually widening outwardly, the outer apical angle sharp. Length 6½—7, breadth 2¾—3 mm.

Hab. N. W. Australia—Port Darwin.

Two examples, apparently including both sexes; three others have also been sent to me by Mr. Walker from Damma Island. This insect is perhaps generically distinct from *Opatrum*, the tarsi being clothed with silky hairs beneath; but in the present imperfect state of our knowledge of the somewhat numerous Australian species of this group, it is inadvisable to separate it. The punctures of the striæ are fine and very closely placed, not coarser than those of the interstices. It is not impossible that this insect may be referable to *O. seriatum*, Boisd., from Radack; the description of that species, however, is wholly inadequate, consisting of seven words only.

Opatrum vagabundum, n. sp.

Moderately elongate, rather narrow, convex, subparallel, black or brownish black, opaque, sparsely clothed with short brownish hairs, which are subserially arranged on the elytral interstices. Head somewhat exserted, densely, rather coarsely punctured, the epistoma very deeply triangularly emarginate and confounded

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with the front, the eyes small and completely divided, the orbits moderately broad and rounded off behind ; antennæ extending to the base of the prothorax, joints 9 and 10 transverse ; prothorax convex, nearly twice as broad as long, rather deeply emarginate in front, strongly bisinuate at the base, moderately rounded at the sides, widest a little before the base, the hind angles subrectangular, the anterior angles rather sharp, the surface densely, somewhat coarsely punctate ; elytra about three and a half times the length of, and of the same width as, the prothorax, parallel in their basal half, finely and rather deeply punctate-striate, the interstices slightly convex, flat toward the suture, sparsely granulate, and feebly transversely wrinkled ; tarsi sparsely clothed with rather coarse hairs beneath ; anterior tibiæ slender, gradually widening outwardly, the outer apical angle sharp. Length $6\frac{1}{3}$—$6\frac{1}{2}$, breadth $2\frac{3}{4}$—3 mm.

Hab. N. W. Australia—Baudin Island and Roebuck Bay.

Two specimens. Easily separable from *O. dispersum*, which also has completely divided eyes, by the distinctly granulate, rather convex elytral interstices, and the more convex, more coarsely punctured thorax, which is more deeply emarginate in front, the broader antennary orbits, and the shorter pubescence.

Crypticus.

Crypticus, Latreille, Règne Anim., ed. 1, iii., p. 298 (1817).

Crypticus submaculatus, n. sp.

Elliptic, narrow, moderately convex, glabrous, piceous or obscure ferruginous, slightly shining, the elytra each with one or two faint oblong spots on the disc at about one-third from the apex, the sides anteriorly, and in one specimen the apex also, rufous or rufo-testaceous, the legs and antennæ rufo-testaceous. Head very densely, minutely punctate; antennæ short, about reaching the base of the prothorax, joints 6—11 strongly transverse ; prothorax strongly transverse, the base feebly truncate-emarginate and with oblong, distinct foveæ, the sides rounded and converging from the base, the entire surface densely, minutely punctate ; elytra about two and one-third times longer than the prothorax, and at the sides forming a continuous outline with it, finely and rather deeply punctate-striate, the interstices almost flat, and closely, minutely punctate ; prosternum produced, lanciform, and received by the narrow

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V-shaped process of the mesosternum; legs moderately long, slender, the tibial spurs long; the first joint of the hind tarsi elongate, nearly as long as the other joints united. Length $2\frac{1}{3}$—$2\frac{1}{2}$ mm.

Hab. N. W. Australia—Roebuck Bay.

Two examples, found on the sandy sea-shore. This minute species possesses all the chief characters of *Crypticus*. In one specimen the markings on the elytra are scarcely visible. The genus has not hitherto been recorded from Australia.

Hyocis.

Hyocis, Pascoe, Journ. Ent., ii., p. 457 (1866).

The species of this genus live at the roots of maritime plants on sandy sea-beaches, according to Mr. Walker.

Hyocis bakewelli.

Hyocis bakewellii, Pasc., Journ. Ent. ii., p. 457.

Hab. W. Australia—Fremantle, Albany, E. Wallaby I. in the Houtmann's Abrolhos Group.

Sent in plenty from both localities. Mr. Pascoe's description was taken from a single specimen, and he gives the colour as "dark ferruginous." In most of the Fremantle specimens the elytra have a common, irregular, O- or U-shaped mark a little beyond the middle, and some spots before and behind it, black. Those from E. Wallaby I. are testaceous, the elytra usually with some small black spots.* The locality given by Mr. Pascoe is Victoria. Two other species of the genus have been described by Macleay.

Hyocis subparallela, n. sp.

Oblong-oval, moderately convex, opaque; piceous or pitchy brown, sometimes with the sides of the head, the sides, base, and apex of the prothorax, and some ill-defined patches on the elytra, ferruginous; the upper surface thickly clothed with yellowish-cinereous appressed scaly hairs; the antennæ and legs ferruginous, the apical joints of the antennæ more or less piceous. Head densely, rugosely punctured; antennæ short, not reaching the base of the

* Specimens similar to these are labelled in Pascoe's collection *H. punctipennis*, Pasc.; but I am unable to find any published description of this insect.

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prothorax, joints 8—11 much wider than those preceding, 9 and 10 strongly transverse; prothorax strongly transverse, widest before the middle, the sides moderately rounded and gradually converging to the rather obtuse hind angles, the anterior angles somewhat prominent, the base feebly sinuate on either side, the disc rather convex and with a shallow median groove which becomes deeper behind, the entire surface densely, rugulosely punctured; elytra three times as long as the prothorax, subparallel to about the middle, deeply punctate-striate (the punctures moderately coarse, approximate, and transverse), the interstices narrow (not wider than the striæ), slightly raised, and thickly, finely punctate, the humeri subrectangular; beneath densely, rugulosely punctured, the punctures on the abdomen finer than those on the metasternum. Length 2½—3 mm.

Hab. W. Australia—Fremantle.

Six examples. Longer and more parallel than *H. bakewelli*, Pasc., the thorax not sinuate at the sides behind, the seriate punctures on the elytra finer and closer, the antennæ much shorter, with the ninth and tenth joints strongly transverse. In Pascoe's collection there is a much more closely-allied form, labelled *H. griseipilis*, Pasc., type, but I am unable to find the description of it.

[PHYCOSECIS.

Phycosecis, Pascoe, Ann. and Mag. Nat. Hist. (4), xvi., p. 213 (1875).

This genus, of which four species were described by Pascoe (two from Australia and two from New Zealand), has five-jointed hind tarsi, the basal joint of all the tarsi being small and not easily seen. It cannot, therefore, be retained in the Heteromera. Pascoe refers it to the "Phaleriides" without hesitation, and does not even mention the form of the tarsi. *Phycosecis* should perhaps be placed in the Clavicorn-series, near Trogositidæ or Cucujidæ.

Phycosecis litoralis.

Phycosecis litoralis, Pascoe, *loc. cit.*, p. 214, nota.

Hab. W. Australia—Fremantle.

Described from King George's Sound. In sand, under tidal refuse (Walker).]

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TRACHYSCELIS.

Trachyscelis, Latreille, Gen. Crust. et Ins., iv., p. 379 (1809).

Trachyscelis ciliaris.

Trachyscelis ciliaris, Champ., Ent. Monthly Mag., xxix., p. 254.

Hab. W. Australia—E. Wallaby I. in the Houtmann's Abrolhos Group, Fremantle, and Cape Leeuwin. Many specimens.

Trachyscelis lævis.

Trachyscelis lævis, Champ., *loc. cit.*

Hab. W. Australia—Port Darwin, Cape Leeuwin, E. Wallaby I., Cassini I., Baudin I., and Adèle I.

Found in plenty at Baudin and Adèle Islands, more sparingly elsewhere.

SCYMENA.

Scymena, Pascoe, Journ. Ent., ii., p. 455 (1866).

The Rev. T. Blackburn remarks (Trans. R. Soc. S. Austr., x., p. 270), that this genus (as represented by his *S. australis*) belongs to the "Pedinides," according to Lacordaire's system; nevertheless, it seems to me, as stated by Mr. Pascoe, to be nearest allied to *Phaleria,* which Lacordaire places, with some hesitation, in the "Trachyscelides."

Scymena amphibia.

Scymena amphibia, Pascoe, Ann. and Mag. Nat. Hist. (4), v., p. 94.

Scymena australis, Blackb., Trans. R. Soc. S. Austr., x., p. 270.

Hab. W. Australia—Albany.

Mr. Pascoe's specimens of *S. amphibia,* which I have examined, were collected by Mr. Masters at King George's Sound. Under tidal refuse on sandy beaches, common (Walker).

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HETEROCHEIRA.

Heterocheira, Lacordaire, Gen. Col., v., p. 335, nota (1859); F. Bates, Trans. Ent. Soc. Lond., 1872, p. 266.

Heterocheira australis,

Uloma australis, Boisd., Voyage de l'Astrolabe, Ent. ii., p. 258 (1835).

Heterocheira australis, Lacord., Gen. Col., v., p. 336, nota; F. Bates, Trans. Ent. Soc. Lond., 1872, p. 266.

VAR.: Smaller, duller, and less elongate, the prothorax and elytra not so finely punctured, the striæ deeper and more coarsely punctate, the interstices towards the sides and apex convex; anterior tarsi with the second and third joints considerably widened in the male. Length 5—6 mm.

Hab. N. W. Australia—Baudin I., Adèle I.

Found in plenty at roots of grass on the sea-shore (Walker).

DIPHYRRHYNCHUS.

Diphyrhynchus, Fairmaire, Rev. et Mag. Zool., 1849, p. 445; F. Bates, Trans. Ent. Soc. Lond., 1872, p. 267.

Acanthosternus, Montrouzier, Ann. Soc. Ent. Fr., 1860, p. 290.

Mr. F. Bates refers this genus and *Heterocheira* to the "Diaperides," without hesitation. He seems to have completely overlooked the very close affinity of *Diphyrrhynchus* and *Phaleria*. Lacordaire's Groupe "Phalériides" would probably be better removed altogether from the "Trachyscelides," and placed as a separate section between the "Trachyscelides" and the "Diaperides."

Diphyrrhynchus, so far as at present known, has precisely the same habits as *Phaleria*, its species being found on the sea shore. It has the epistoma deeply emarginate, as in *Scymena*, and the intermediate joints of the four front tarsi are similarly dilatate in the male. *Heterocheira* resembles the parallel forms of *Phaleria* (*P. parallela*, Woll., etc.), but has the anterior tibiæ much less widened. Mr. F. Bates (*op. cit.*) states that in both *Diphyrrhynchus* and *Heterocheira*, the first four joints of the intermediate tarsi are strongly, and those of the

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anterior more broadly, dilated in the male than in the female: this is not so in any of the species before me, the second and third joints only being dilated and the penultimate one small. *Diphyrrhynchus* chiefly differs from *Phaleria* in having a much more prominent trochantin to the middle coxæ.

Diphyrrhynchus ellipticus, n. sp. (Plate VIII., fig. 1, ♂.)

Regularly elliptic, convex, pitchy-black with a brassy lustre, opaque or slightly shining. Head short, deeply sunk into the prothorax, rather convex, finely and sparsely punctured; the epistoma very deeply emarginate for the reception of the labrum, separated from the sides of the front only by a faint (sometimes quite obsolete) oblique groove; eyes coarsely granulated, oblique, small, the lower portion slightly larger than the upper portion, the antennary orbits as seen from above) extending nearly half-way across them; antennæ fusco-testaceous, short, scarcely reaching the base of the prothorax, the outer five joints gradually widened, 8-10 transverse, 11 twice as long as 10, rounded at the apex; prothorax short, at the base about two-and-a-half times as broad as long, convex, the sides rapidly converging from the base, a little rounded anteriorly, and sharply but finely margined, the base feebly trisinuate and with a very shallow triangular fovea on either side, the anterior angles rather prominent, the hind angles subrectangular, the apex broadly and somewhat deeply emarginate, the disc very minutely and sparsely punctured, the lateral portion more distinctly punctate; scutellum broadly triangular, short, large, minutely punctate in front; elytra regularly convex, scarcely wider than the prothorax at the base and forming almost a continuous outline with it, very sharply margined and somewhat rounded at the sides, obsoletely and minutely punctate-striate, the striæ becoming deeper towards the apex, the interstices very minutely, sparsely punctate, flat at the base, slightly convex towards the apex, the punctures of the striæ closely placed and very little coarser than those of the interstices; beneath piceous or pitchy-brown, shining, sparsely pubescent, and sparsely, moderately finely punctured; legs pitchy-brown or fusco-testaceous; the tibiæ coarsely roughened and setose, flattened and dilated, the anterior pair very broad; prosternum horizontal, widened and produced behind, ovate, the mesosternum obliquely carinate on either side and excavate in the middle for its reception. ♂. Anterior and intermediate tarsi with the second and third joints broadly dilated. Length 4½—6, breadth 2½—3 mm. (♂ ♀).

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Hab. N. W. Australia—Baudin I., Troughton I., Port Darwin.

Many specimens. Closely allied to *D. ovalis*, F. Bates, from New Caledonia, but more convex, duller, and more distinctly punctured, the elytra very finely punctate-striate. The elytra, at first sight, appear to merely have a series of very shallow, fine, longitudinal grooves, which become deeper towards the apex, the punctures in them being very little coarser than those of the interstices. The punctuation of the head is distinctly coarser than that of the prothorax and elytra. The Port Darwin specimens are less opaque and rather narrower than the others.

Diphyrrhynchus apicalis, n. sp. (Plate VIII., fig. 4, ♂.)

Oblong-ovate, subparallel, convex, castaneous with a faint brassy lustre, opaque; the upper surface very sparsely and exceedingly minutely punctate, the punctures on the head a little more distinct. Head short, deeply sunk into the prothorax, rather convex; the epistoma very deeply emarginate for the reception of the labrum, separated from the sides of the front by a very shallow oblique groove; eyes coarsely granulated, small, almost hidden beneath the anterior margin of the prothorax, the antennary orbits not extending half-way across them; antennæ testaceous, very short, about reaching the middle of the prothorax, thickening outwardly, joints 7—10 transverse; prothorax at the base barely twice as broad as long, the sides parallel behind, rounded and converging anteriorly, and sharply margined, the base very feebly trisinuate and with a shallow fovea on either side just within the margin, a narrow longitudinal space down the middle impunctate; elytra at the base not wider than the prothorax, parallel to about the middle, the sides rounded and converging thence to the apex, the surface with regular rows of exceedingly minute punctures, which are scarcely distinguishable from those of the interstices and on the apical declivity are placed in rather deep striæ, the interstices quite flat to about one-fourth from the apex, slightly convex beyond; beneath obscure reddish-testaceous, slightly pubescent, sparsely, moderately finely punctured; legs reddish-testaceous; the tibiæ very broadly widened, coarsely roughened and setose, the inner face of the anterior pair smoother; prosternum horizontal, widened and produced behind, lanciform, the mesosternum slightly excavate in the middle for its reception. ♂. Anterior and intermediate tarsi with the second and third joints moderately dilated. Length 5 mm. (♂.)

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Hab. W. Australia—Roebuck Bay.

One example. Easily distinguishable from *D. ellipticus* by its subparallel shape, the shorter antennæ, the less transverse thorax, its wider tibiæ, and the still more minute punctuation of the upper surface. The elytral interstices are perfectly flat to about one-fourth from the apex and thence to the apex abruptly, moderately, convex; the striæ are scarcely visible, except under a strong lens, though they are sharply defined on the apical declivity.

Corticeus.

Corticeus, Piller et Mitterpacher, Iter per Pos. Sclav., p. 87 (1783).

Hypophlœus, Fabricius, in Schneider's Neu Mag. Ent., i., 1, p. 24 (1791).

Corticeus australis, n. sp.

Moderately elongate, subcylindrical, shining, varying in colour from castaneous to black, the head always paler in front; the antennæ and legs testaceous or fusco-testaceous. Head closely, finely punctate; the eyes very large, oblique, coarsely granulated, separated by a space about equalling the width of one of the eyes as seen from above; antennæ not nearly reaching the base of the prothorax, joints 5—11 stout, 5—10 very strongly transverse; prothorax convex, not longer than broad, a little narrowed in front and behind, the hind angles distinct, the entire surface closely, finely punctate; elytra about two and a fourth times longer than the prothorax, and a little less closely punctured than it. Length 2½ mm.

Hab. N. W. Australia—Adelaide River.

This minute species is the first of the genus recorded from Australia. It has unusually large eyes, the interocular space not wider than the diameter of one of the eyes as seen from above. Found under the bark of *Ficus* sp. Many specimens.

Palorus.

Palorus, Mulsant, Col. Fr., Latigènes, p. 250 (1854).

This cosmopolitan genus is not included in Masters's Catalogue. Its species are sometimes found out of doors, under bark. *Palorus* is probably of Eastern origin.

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Palorus melinus.

Hypophlœus melinus, Herbst, in Fuessly's Archiv, v., p. 37, t. 21, figs. B, *b* (1784).
Hypophlœus depressus, Fabr., in Schneider's Neu Mag. Ent., i., 1, p. 25.
Ips unicolor, Oliv., Ent., ii., No. 18, p. 12, t. 2, figs. 8 *a*, *b*.

Hab. N. W. Australia—Port Darwin, Adelaide River, Roebuck Bay.

Numerous specimens, found under bark, away from habitations. These examples are smaller, and have the head and prothorax more finely punctured than usual in *P. melinus*. A cosmopolitan insect, occurring all over the world; I have similar specimens from such widely-separated localities as Damma Island (Walker), Marocco, and Mexico. It is probable that two species are confused in collections, but I hesitate to separate them at present. *P. delicatulus*, Reitter, from the East Indies, the fragmentary type of which has been lent me by Mr. René Oberthür, is a shorter and broader insect than *P. melinus*. A third species, from Damma Island, at present undescribed, has been sent to me by Mr. Walker.

LYPHIA.

Lyphia, Mulsant, Opusc. Ent., ix., p. 166 (1859); Jacq.-Duval, Gen. Col. Europ., iii., p. 305.
Lindia, Blackburn, Trans. R. Soc. S. Austr., x., p. 275 (1888).

Lyphia tasmanica, n. sp. (Plate VIII., fig. 6.)

Elongate, narrow, subcylindrical, subopaque, obscure ferruginous, the head and prothorax infuscate. Head densely, finely punctate; antennæ ferruginous, very short, the apical four joints abruptly widened and strongly transverse; prothorax convex, a little longer than broad, the sides parallel behind and feebly rounded in front, the hind angles acutely rectangular, the disc slightly depressed in the middle before the base, the entire surface very densely, finely punctate, the punctures showing a tendency to become longitudinally confluent; elytra nearly two and a half times as long as, and slightly broader than, the prothorax, densely,

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very finely, confusedly punctate, here and there very distinctly transversely wrinkled, and with numerous interrupted darker lines resembling faint striæ ; legs rufo-testaceous. Length $3\frac{1}{4}$—$3\frac{1}{3}$ mm.

Hab. Tasmania—Hobart.

Two specimens, found under bark. This insect agrees with the description (so far as it goes) of *Lindia angusta*, Blackb., from Port Lincoln, except as regards the form of the antennæ : as long as the head and thorax together in *L. angusta*, very little longer than the middle of the head in *L. tasmanica*. Narrower and smaller than the European *L. tetraphylla*, Fairm. (= *ficicola*, Muls.), the upper surface much more finely punctured. The elytral punctuation is confused, but in certain positions indistinct rows of punctures are visible. The dark lines apparently show through from beneath. The size of *L. angusta* is not mentioned by its describer.*

ARRHENOPLITA.

Oplocephala, Laporte et Brullé, Ann. Sciences Nat., xxiii., p. 338 (1831) (nomen præocc.).
Arrhenoplita, Kirby, Faun. Am.-Bor., iv., p. 235.
Evoplus, Leconte, New Sp. Col., p. 128.

Two species of this widely-distributed genus have already been described from Australia.

Arrhenoplita pygmæa, n. sp.

♂. Oblong, very convex, castaneous or rufo-testaceous, shining, finely pubescent. Head short, very shining, smooth and depressed between the eyes, armed on either side above the point of insertion of the antennæ with a very long, erect, nearly straight horn, the epistoma very short, limited behind by a deep groove ; the eyes black, large, very coarsely granulated, almost entire ; antennæ short, not nearly reaching the base of the prothorax, joints 3—6 slender, very short, 7—11 greatly widened and forming a large 5-jointed club, 7—10 perfoliate, strongly transverse, equal in width, 11 very short, much narrower than 10 and closely articulated to it ; prothorax tranversely convex, nearly twice as broad as long, rounded at the sides, densely, finely punctate and with a smooth central line ; elytra about two and a half times longer than the prothorax, confusedly punctured, the punctures a little coarser

* The specific name is preoccupied, *Hypophlæus angustus*, Luc., from Algeria, being a *Lyphia* (*cf.* Bedel, Ann. Soc. Ent. Fr., 1887, p. 199).

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and more scattered than those on the prothorax; legs short, the tibiæ slender. ♀. Head unarmed, with the interocular space less shining and somewhat thickly punctured, the transverse groove behind the epistoma apparently deeper; the prothorax narrower, less convex, less rounded at the sides, more parallel behind. Length 2—2⅛ mm.

Hab. N. W. Australia—Port Darwin, Adelaide River.

Numerous examples. This very small species approaches the European *Iphicorynus chrysomeloides*, Rossi (*melanophthalmus*, Muls.), but it is best placed in *Arrhenoplita*. It resembles a *Cis*. The tenth and eleventh joints of the antennæ are so closely articulated as to appear subconnate. Found in dry fungus on old posts in company with *A. exilis* (Walker).

Arrhenoplita exilis, n. sp.

♂. Oblong, very convex, castaneous, shining, glabrous. Head very shining, smooth and depressed between the eyes, and armed on either side between them with a long, erect, straight horn, the epistoma rather large and limited posteriorly by a shallow groove, the anterior margin sharply, triangularly raised on either side in front; the eyes large, coarsely granulated, almost entire; antennæ nearly reaching the base of the prothorax, joints 3—6 slender, 3 much longer than 4, 4—6 short, 7—11 perfoliate, widened, and forming an elongate gradually widening club, 7—10 transverse, 8—10 strongly so and much wider than 7, 11 twice as long as 10, constricted at the middle, and truncate at the apex; prothorax transversely convex, nearly twice as broad as long, rounded at the sides, very finely, densely punctate; elytra about two and a half times longer than the prothorax, closely, confusedly, very finely punctured. ♀. Head unarmed, densely, minutely punctured, with the transverse groove behind the epistoma deep; the prothorax less convex and more parallel. Length 2¼ mm.

Hab. N. W. Australia—Port Darwin.

One pair. This species resembles *A. pygmæa*, but it is a little larger and more finely punctured, and destitute of pubescence. The antennæ are more elongate, and have their apical joint fully as wide, and twice as long, as the tenth; in *A. pygmæa* the apical joint is extremely short and much narrower than the tenth. At first sight, the antennæ appear to be 12-jointed, the apical joint being constricted at the middle and shaped like the united apical two joints in *A. pygmæa*.

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Platydema.

Platydema, Laporte et Brullé, Ann. Sciences Nat., xxiii., p. 350 (1831).

Platydema limacoides.

Platydema limacoides, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 280.

Hab. Tasmania—New Norfolk, Franklin, and Hobart.

A few specimens, agreeing perfectly with the type. The locality given by Pascoe is Victoria (?). Under *Eucalyptus* bark (Walker).

Platydema tetraspilotum.

Neomida tetraspilota, Hope, Proc. Ent. Soc. Lond., 1842, p. 78; Trans. Ent. Soc. Lond., 1845, p. 108.
Alphitophagus tasmanus, Mars., Ann. Soc. Ent. Fr., (5), vi., p. 110.
Platydema pascoei, Macl., Trans. Ent. Soc. N.S.W., ii., p. 280.

Hab. Tasmania—Hobart, Launceston, New Norfolk, Franklin.

I have examined Hope's type in the Oxford Museum. Common, under bark (Walker).

Platydema bicinctum, n. sp.

Elongate-oval, narrow, very depressed, shining; piceous or pitchy-brown; the front of the head, the sides, base, and apex of the prothorax narrowly, and a broad transverse fascia on the elytra a little below the base, and another just before the apex, connected along the suture, reddish-testaceous; the antennæ, legs, and under surface rufo-testaceous. Head densely, minutely punctate; the eyes large, coarsely faceted, oblique, and deeply emarginate; antennæ about reaching the base of the prothorax, joints 4—11 widened, 5—10 transverse, 11 nearly twice as long as 10; prothorax convex, about twice as broad as long, widest a little before the base, not much broader at the base than at the apex, the sides strongly rounded anteriorly, and sharply margined, the base bisinuate, the apex (viewed from above) truncate, the hind angles rectangular, the anterior angles obtuse, the basal foveæ oblique and rather deep, the entire surface densely, finely punctate; scutellum triangular, rather large; elytra nearly four times as long as, and slightly

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wider than, the prothorax, subparallel to a little beyond the middle, regularly punctate-striate, the punctures rather fine and very closely placed, the interstices flat, densely, very finely punctate; beneath closely, finely punctate, the metasternum smoother; prosternum very narrow, parallel, produced behind; epipleuræ extending to the last ventral suture; legs slender. Length 3¼—3½, breadth 1⅛ mm.

Hab. N. W. Australia—Adelaide River.

Seven examples. This species is allied to *P. tetraspilotum*, Hope, but is smaller, flatter, and more parallel, the thorax rounded at the sides, and distinctly narrowed behind. This last-mentioned character, combined with its subparallel shape, gives it a different facies from most of the other representatives of the genus. *P. bicinctum* varies in the extent of the light markings on the elytra, according to the predominance of the light or of the dark colour; the anterior fascia does not reach the base, but it sometimes extends to the lateral margin. Found under bark of a dead Acacia (Walker).

Platydema deplanatum, n. sp.

Oblong-oval, narrow, very depressed, black, shining, the labrum and antennæ ferruginous, the legs rufo-testaceous. Head closely, finely punctate, the eyes moderately large, deeply emarginate; antennæ as in *P. bicinctum*; prothorax convex, twice as broad as long, widest a little behind the middle, not much broader at the base than at the apex, the sides rounded and rather sharply margined, the base bisinuate, the apex (viewed from above) subtruncate, the hind angles rather obtuse, the basal foveæ distinct, the surface closely and somewhat coarsely punctured, the punctures a little more scattered on the middle of the disc; elytra about three and a half times as long as, and slightly wider than, the prothorax, subparallel in their basal half, rather coarsely punctate-striate, the punctures closely packed and deep, the interstices almost flat, each with an irregular row of fine punctures; legs slender. Length 3, breadth 1¼ mm.

Hab. N.W. Australia—Adelaide River.

One specimen, found under bark. Allied to *P. bicinctum*, but less elongate, the punctuation of the upper surface much coarser, the elytral interstices each with a single row of punctures only, the thorax more rounded at the sides behind, and with more obtuse hind angles, the upper surface shining black.

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Ennebœus.

Ennebœus, C. O. Waterhouse, Trans. Ent. Soc. Lond., 1878, p. 228.

Ennebœus, so far as at present known, is confined to Tasmania and tropical America,* the species from such widely different regions being exceedingly closely allied.

The species of this genus are found under bark, according to Mr. Walker.

Ennebœus ovalis.

Ennebœus ovalis, C. O. Wat., *loc. cit.*, p. 229.

Hab. Tasmania—Franklin, Huon River.

Originally described from Tasmanian examples.

Ennebœus australis, n. sp. (Plate VIII., figs. 2, 2*a*.)

Oblong-elliptic, pitchy-brown, shining, the legs and antennæ rufo-testaceous; the entire upper surface very densely, minutely punctured, and clothed with yellowish-cinereous pruinose pubescence. Antennæ rather long and slender, joints 5—8 subequal, longer than broad, 9—11 forming an elongate club, 9 triangular, slightly longer than broad, 10 and 11 transverse, 11 very abruptly truncate at the apex; prothorax strongly transverse, rapidly narrowing from the base, the latter deeply sinuate on either side of the middle; elytra more elongate than in *E. ovalis*, with numerous scattered coarser punctures, which are partly arranged in irregular series. Length 4½ mm.

Hab. Tasmania—Hobart.

Larger and more elongate than *E. ovalis;* the antennæ longer, and with the ninth joint more elongate; the elytra with numerous scattered coarser punctures on the disc, the punctures showing a tendency to form striæ. One specimen.

Ennebœopsis, n. gen.

Last joint of the maxillary palpi moderately stout, oblong-ovate, obliquely truncate at the tip; eyes moderately large, almost entire, rather coarsely faceted; epistoma short, separated from the front by an impressed line; labrum moderately prominent; antennæ about reaching the base of the prothorax, joint 1 stout, 2

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* *Cf.* Champ. Biol. Centr.-Am., Col. iv., 1, pp. 539, 540 (1893).

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short, slender, 3 nearly twice as long as 2, slender, 4 almost as broad as long, 5—11 perfoliate, very strongly transverse, widening outwardly, 5 twice as broad as 4, 11 abruptly rounded at the tip; prothorax strongly transverse, with broad median lobe at the base, the base deeply sinuate on either side; scutellum strongly transverse; elytra closely embracing the base of the prothorax, and at the sides forming almost a continuous outline with it; prosternum strongly horizontally produced, widened behind the coxæ, and deeply excavate beneath for the reception of the mesosternum, the latter convexly raised in the middle in front, and obliquely grooved on either side; epipleuræ extending to the apex of the elytra, moderately wide in their basal third, narrower beyond; middle coxal cavities widely open externally, the trochantin large and prominent; hind coxæ transverse, narrowly separated, the intercoxal process narrow, triangular; tibiæ slightly widened and compressed, obliquely truncate at the apex, subequal, the spurs short; tarsi slender, thickly clothed with short silky hairs beneath, the anterior pair feebly dilated in the male, the first joint of the hind pair a little longer than the following two joints united; body convex, elliptic, winged.

This genus is proposed for a single species from Tasmania. *Ennebœopsis* has entirely the facies and sculpture of *Ennebœus*, Wat., but differs from it in the perfoliate, strongly transverse outer joints of the antennæ. The prosternum is similarly shaped in both. *Ennebœopsis* connects *Ennebœus* with the more typical genera of Diaperinæ.

Ennebœopsis pruinosus, sp. n. (Plate VIII., figs. 3, 3*a*.)

Pitchy-black, shining, the entire upper surface very densely, exceedingly minutely punctate, clothed with fine pruinose pubescence; antennæ and legs rufo-testaceous. Prothorax strongly transverse, the base deeply sinuate on either side of the median lobe, and with distinct foveæ, the sides converging from the base; elytra more than three times as long as the prothorax, with indistinct rows of coarser punctures on the disc; beneath varying in colour from piceous to testaceous, very densely, minutely punctate, finely pubescent; fifth ventral segment triangularly emarginate at the apex, and the anterior tarsi feebly dilated, in the male. Length 3—3½ mm. (♂ ♀.)

Hab. Tasmania—Hobart.

Four examples; found under the loose bark of a *Eucalyptus* stump.

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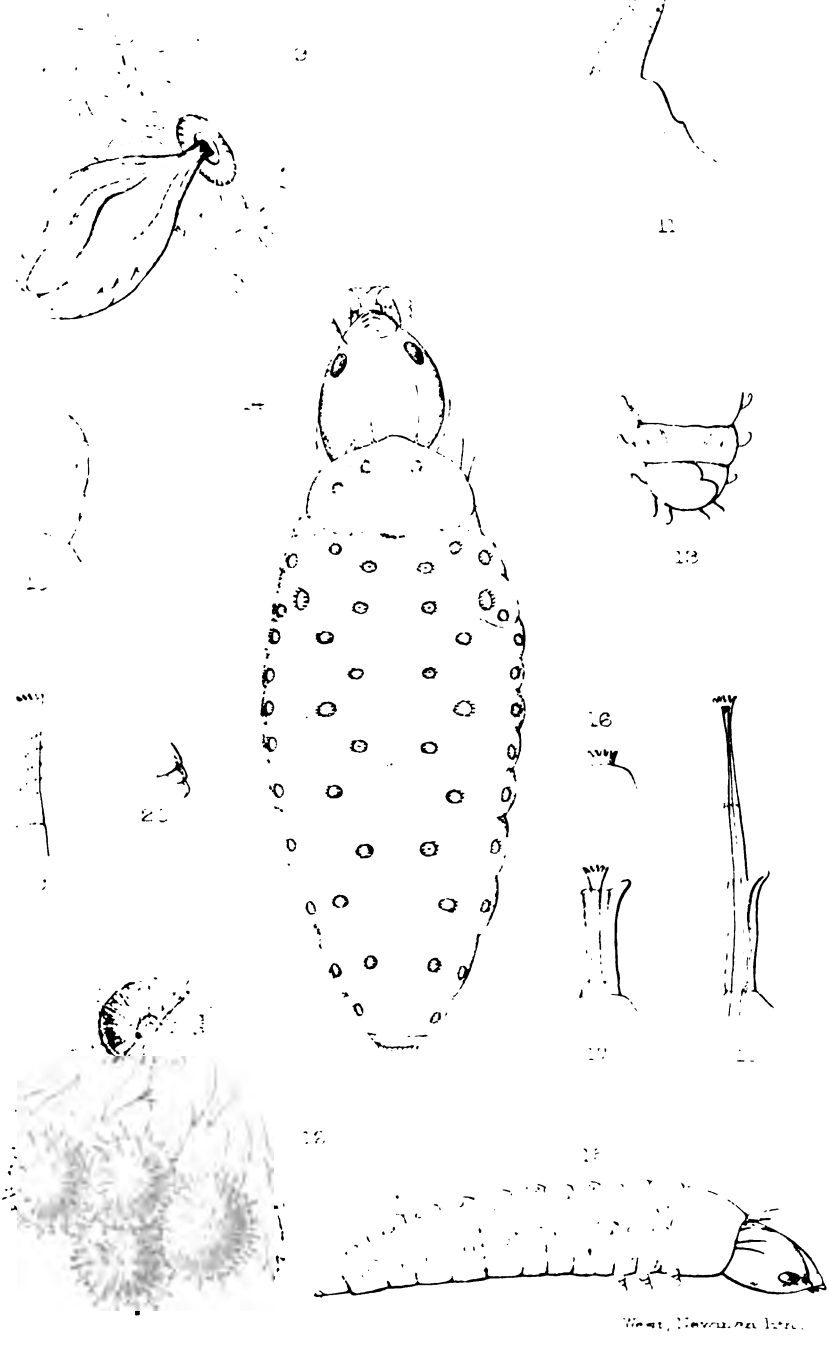

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DIPSACONIA.

Dipsaconia, Pascoe, Journ. Ent., i., p. 123 (1860).

Dipsaconia australis.

Endophlæus australis, Hope, Trans. Ent. Soc. Lond., 1845, p. 108.
Dipsaconia bakewellii, Pascoe, Journ. Ent., i., p. 124, t. 7, fig. 6.

Hab. Tasmania—Hobart and Launceston.

In none of the specimens before me are the blackish markings of the elytra symmetrical. I have examined the type of *Endophlæus australis*, Hope, from Adelaide, and also that of *D. bakewelli*, Pascoe. *D. pyritosa*, Pascoe, is a closely allied form, but has much shorter hairs on the prothorax and elytra. Under bark of *Eucalyptus* (Walker).

ULODES.

Ulodes, Erichson, in Wiegmann's Archiv, 1842, 1, p. 180.

Ulodes verrucosus.

Ulodes verrucosus, Er., *loc. cit.*, p. 181, t. 5, figs. 1, *a*, *b*.
Endophlæus variicornis, Hope, Proc. Ent. Soc. Lond., 1842, p. 78; Trans. Ent. Soc. Lond., 1845, p. 108.

Hab. Tasmania—Hobart and Launceston.

Many specimens, chiefly found under the dry loose bark of "sassafras" trees (*Atherosperma moschatum*). Erichson's insect was from Tasmania, that of Hope from Adelaide.

GANYME.

Ganyme, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 32 (1869).

Ganyme sapphira.

Boletophagus sapphira, Newm., Entom., i., p. 104.
Ganyme sapphira, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 33.

Hab. Tasmania—Hobart.

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One specimen, differing from the type, which is contained in the National collection, in having the elytral pubescence almost entirely black, with the exception of two small patches on each elytron. *G. howitti*, Pasc., is probably only a small variety of the same species with the pubescence of the prothorax and elytra almost entirely reddish-ochreous.

Caanthus, n. gen.

Mentum strongly transverse; last joint of the maxillary palpi stout, oval, that of the labial pair slender; mandibles bifid at the tip; gula feebly grooved behind the suture; epistoma truncate in front; eyes coarsely granulated, small, entire, projecting laterally beyond the antennary orbits, the latter not prominent; antennæ not reaching the base of the prothorax, joints 1 and 2 stout, longer than broad, 3—9 slender, 3 considerably longer than 4, 4—9 very short, 7—9 strongly transverse, 10 and 11 forming a very stout club, 10 transverse, 11 about as broad as long, obliquely truncate at the tip; prothorax longitudinally convex, strongly compressed towards the sides, and with the apex broadly produced in the middle over the head° (partly hiding it when viewed from above), the base with broad median lobe; scutellum not visible; elytra about twice as long as the prothorax; prosternum very narrow, declivous; hind coxæ widely separated, the intercoxal process broad, truncate in front; epipleuræ broad at the base, gradually narrowing to the apex; ventral sutures deep; legs short, without distinct tibial spurs, the tibiæ convex on their outer edge; tarsi simple, clothed with silky hairs beneath; the basal joint of the hind tarsi scarcely equalling joints 2 and 3 united, the three together not longer than 4; body elongate, convex, thickly covered with brownish scales, the upper surface with coarse scattered granular elevations.

This genus is proposed for a minute insect from Tasmania. The general shape is suggestive of that of the American genus *Calymmus*, of the Bolitophagides, in which group it must be placed. The stout 2-jointed club of the antennæ, the gibbous, anteriorly produced, compressed thorax, and the very small, unemarginate eyes are its chief characters.

Caanthus gibbicollis, sp. n. (Plate VIII., figs. 7, 7*a*, *b*.)

Elongate-oval, narrow, moderately convex, pitchy-black, the head ferruginous in front; densely covered with brownish scales, the pro-

° Our artist has omitted to show this in the figure.

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thorax and elytra with numerous coarse, granular elevations, those on the elytra serially arranged, these elevations bearing long, erect, fine bristly hairs; antennæ and legs rufo-testaceous. Prothorax in the middle about as long as broad, the sides rounded and coarsely crenate, the anterior angles produced and prominent, the base rather deeply sinuate on either side of the broad median lobe, the hind angles obtuse, the broad anterior prolongation truncate in front (when viewed from above) and extending forwards nearly as far as the front of the head; elytra not wider than the prothorax, subparallel to beyond the middle, with the shoulders rounded, the granular elevations closely placed and forming about six irregular rows on each elytron; beneath, when denuded of scales, ferruginous, shining, the flanks of the prosternum and the middle of the metasternum with coarse, scattered granular elevations. Length 2 mm.

Hab. Tasmania—Launceston and Hobart.

Two specimens, found under bark. The upper surface is so densely covered with adherent, earthy-looking scales that the granular elevations are alone visible, the rest of the sculpture being completely hidden. The hairs on the thorax and elytra are perfectly erect.

TRIBOLIUM.

Tribolium, Macleay, Annulosa Jav., 1825, p. 47.

This cosmopolitan genus is not included in Masters's Catalogue.

Tribolium ferrugineum,

Trogosita ferruginea, Fabr., Spec. Ins., i., p. 324.

Hab. Tasmania—Hobart.

ALPHITOBIUS.

Alphitobius, Stephens, Ill. Brit. Ent., v., p. 11 (1832).

Alphitobius piceus.

Helops piceus, Oliv. Ent., iii., No. 58, p. 17, t. 2, figs. 13, *a*, *b*.

Alphitobius piceus, Muls., Col. Fr., Latig., p. 237.

Hab. N. W. Australia—Adelaide River.

One specimen of this cosmopolitan insect has been sent by Mr. Walker to the British Museum. The species is not included in Masters's Catalogue.

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Toxicum.

Toxicum, Latreille, Gen. Crust. et Ins., ii., p. 167.

Toxicum punctipenne.

Toxicum punctipenne, Pascoe, Journ. Ent., ii., p. 454.
Toxicum addendum, Blackb., Proc. Linn. Soc. N. S. W., iii. (2), p. 1431.

Hab. N. W. Australia—Port Darwin, Adelaide River.

Many specimens of both sexes. In the male of this insect the anterior femora are subangularly dilated on the inner side towards the base; of this no mention is made by Mr. Blackburn. I have examined the types of *T. punctipenne*, Pasc.; the length given "2½ millim." is evidently a misprint for "5½ millim." Mr. Blackburn's specimens of *T. addendum* were from the northern territory of South Australia. Found under logs and loose bark (Walker).

Paratoxicum, n. gen.

Mentum nearly as broad as long, widest in front and gradually narrowing behind; last joint of the maxillary palpi broad ovate, short, very obliquely truncate at the tip, that of the labial pair narrow, ovate; inner lobe of the maxillæ armed with a curved claw at the tip; labrum not prominent; mandibles bifid at the tip; head unarmed, short, almost trapezoidal, sunk into the prothorax up to the eyes, the antennary orbits a little swollen, extending completely across the eyes behind and obliquely converging in front, the epistoma broad, truncate in front, and limited behind by a rather deep groove; eyes small, oblique, moderately coarsely granulated, the upper and lower portions equal; antennæ about reaching the base of the prothorax, similarly sculptured throughout, stout, gradually widening outwardly, joints 1 and 2 short, 3 about twice as long as 2 and considerably longer than 4, 4—11 decreasing in length and increasing in width, 8—11 strongly transverse, 11 bluntly rounded at the tip; prothorax transverse, bisinuate at the base and apex, the apex broadly, feebly lobed in the middle; scutellum short, transversely triangular; elytra nearly three times as long as, and at the sides forming a continuous outline with, the prothorax, parallel for two-thirds of their length, sharply margined laterally; prosternum narrow, produced behind, the mesosternum not excavate for its reception; inter-

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mediate coxal cavities open externally, the trochantin prominent; intercoxal process of the abdomen subtriangular; elytral epipleuræ entire, broad, equal in width from opposite the metathoracic epimera to near the apex, widened towards the base; legs rather short; anterior tibiæ flattened and subtriangularly dilated, with rather long spurs, the four hinder tibiæ with very short spurs; tarsi simple, sparsely clothed with long hairs beneath; posterior tarsi with the basal joint short, joints 1—3 united very little longer than the apical one; body elongate, parallel, winged.

This genus is proposed for a Tasmanian insect allied to *Toxicum* (and *Anthracias*), from which it chiefly differs in having the head unarmed, the antennæ gradually widened to the apex (their three or four outer joints not forming a club nor densely punctured and pubescent), and the epipleuræ broad and entire. *Epitoxicum*, F. Bates, is also an allied genus. The head is not swollen on either side near the eyes as in the females of *Toxicum*, nor cornute. The antennal joints are shining and similarly sculptured throughout. The sex of the two specimens received has not been ascertained.

Paratoxicum iridescens, n. sp. (Plate VIII., figs. 8, 8*a–c*.)

Elongate, narrow, parallel; the head, oral organs, antennæ, and legs ferruginous, the prothorax and elytra dull black, the prothorax in one specimen indeterminately ferruginous towards the sides and apex, the entire upper surface iridescent. Head densely, very minutely punctate, the epistoma a little smoother; prothorax about one-third broader than long, rather convex, strongly bisinuate at the base and feebly so at the apex, the sides parallel from about the middle to the base and rounded in front, the hind angles acutely rectangular, the anterior angles rather sharp, the base very finely margined and obsoletely foveate on either side, the entire surface densely, minutely punctate; elytra a little flattened on the disc, with regular rows of fine punctures, the interstices flat, smooth; beneath shining, obscure castaneous, closely and finely punctured along the middle, the sides of the metasternum (but not the episterna) with coarser punctures, the ventral segments 1—3 more sparsely punctured towards the sides, the flanks of the prothorax finely strigose. Length $5\frac{2}{3}$, breadth 2 mm.

Hab. Tasmania—New Norfolk.

Two specimens, found under bark of *Eucalyptus*.

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Helæus.

Helæus, Latreille, Règne Anim., ed. 1, iii., p. 301 (1817).

Helæus perforatus.

Helæus perforatus, Latr., Règne Anim., ed. 2, iii., p. 32, t. 3, fig. 6 ; de Brême, Essai Monogr. Cossyph., i., p. 55, t. 6, fig. 2, and t. 1, figs. 1, 2, 5—8 ; Macl., Proc. Linn. Soc. N. S. W., ii. (2), p. 641.

Hab. W. Australia—Fremantle.

Originally described from Kangaroo Island. Under stones in sandy places (Walker).

Pterohelæus.

Pterohelæus, de Brême, Essai Monogr. Cossyph., i., p. 27, t. 1, figs. 1—4, B (1842).

Pterohelæus nigricornis, n. sp.

Pterohelæus nigricornis, F. Bates, in litt.

Broad oval, moderately convex, above and beneath, the legs and antennæ black, the upper surface opaque. Head smooth, the epistoma separated on either side from the front by a fine oblique groove, the sides of the front broadly arcuately expanded, slightly raised, and projecting beyond the eyes ; the latter not prominent, very finely faceted, and separated by a space about equalling the width of one of the eyes as seen from above ; prothorax almost smooth, strongly transverse, fully three times as wide at the base as it is long in the centre, very deeply emarginate in front, deeply bisinuate behind, the sides arcuately and very rapidly converging from the base, the disc moderately convex and sometimes with indications of a fine impressed central line, the margins broadly explanate, the outer edge reflexed, the anterior angles rounded, the hind angles sharp and prolonged backwards; scutellum smooth; elytra a little wider than, and nearly four times the length of, the prothorax, rapidly arcuately narrowing from the middle, obliquely truncate on either side at the base, and with rather obtuse humeri, the disc moderately convex, somewhat abruptly declivous beyond the middle ; each elytron with seven or eight equidistant costæ, which become altogether obsolete on the apical declivity, the interspaces each with a double row of very fine, lightly impressed, punctures not extending to the apex ; the margins broadly ex-

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planate, the outer limb reflexed ; beneath slightly shining, almost smooth, the ventral segments 1—3 feebly longitudinally wrinkled ; prosternum produced behind and received by the rather deeply excavate mesosternum. Length 17½—18½, breadth 12½—13½ mm.

Hab. N.W. Australia—Port Darwin and Adelaide River.

Three specimens, two of which have been sent by Mr. Walker to the British Museum; also contained in Mr. F. Bates's collection, where it is labelled with the name I have adopted. Less elongate and more oval than *P. walkeri*, de Brême, *P. piceus*, Kirby, and *P. cornutus*, Macl., the elytra smooth at the apex, the legs and antennæ entirely black. Two of Mr. Walker's specimens were dead and mutilated when found.

Pterohelæus reichei.

Pterohelæus reichei, de Brême, Essai Monogr. Cossyph., i., p. 35, t. 2, fig. 2; Macl., Proc. Linn. Soc. N. S. W. (2), ii., p. 531.

Hab. Tasmania—Hobart.

Several specimens, agreeing well with de Brême's figure. Found under loose bark of *Eucalyptus*.

Pterohelæus parallelus.

Pterohelæus parallelus, de Brême, Essai Monogr. Cossyph., i., p. 33, t. 2, fig. 7; Macl., Proc. Linn. Soc. N. S. W. (2), ii., p. 542.

Hab. W. Australia—Fremantle.

One specimen of this species has been sent by Mr. Walker to the British Museum. The type was obtained at Swan River.

Pterohelæus bullatus.

Pterohelæus bullatus, Pascoe, Journ. Ent., ii., p. 462; Macl., Proc. Linn. Soc. N. S. W. (2), ii., p. 536.

Hab. W. Australia—Fremantle.

One specimen.

Pterohelæus peltoides.

Pterohelæus peltoides, Macl., Proc. Linn. Soc. N. S. W. (2), ii., p. 546.

Hab. S. Australia—Port Adelaide.

One specimen.

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Pterohelæus peltatus.

Cilibe peltata, Er. in Wiegmann's Archiv, 1842, p. 175.
Pterohelæus peltatus, de Brême, Essai Monogr. Cossyph., i., p. 34, t. 2, fig. 1; Macl., Proc. Linn. Soc. N. S. W. (2), ii., p. 545.

Hab. Tasmania—Launceston and Hobart.

Originally described from Tasmania. Found under loose bark of *Eucalyptus*.

SYMPETES.

Sympetes, Pascoe, Journ. Ent., ii., p. 464 (1866).

Sympetes tricostellus.

Encephalus tricostellus, White, Voy. Capt. Grey, App., p. 464 (1841); de Brême, Essai Monogr. Cossyph., i., p. 53, t. 5, fig. 6.
Sympetes tricostellus, Macl., Proc. Linn. Soc. N. S. W., ii. (2), p. 652.

Hab. W. Australia—Albany.

A specimen of this species in the Hope Collection at Oxford bears the MS. name of *latipennis*, Hope, in his own handwriting. Sandy places, under stones (Walker).

Sympetes patelliformis.

Saragus patelliformis, Pascoe, Ann. and Mag. Nat. Hist. (4), v., p. 100.

Hab. W. Australia—Fremantle.

One example, agreeing pretty closely with Pascoe's type, but differing from it in having the prothorax more densely punctured and with sharper anterior angles. A specimen of this species is contained in the Hope Collection at Oxford, with the name *subrugosus*, Hope, attached, but it does not agree with the description or figure of *S. subrugosus*, de Brême; and there is also another in Mr. F. Bates's Collection, from Champion Bay.

Sympetes duboulaii.

Saragus duboulaii, Pascoe, Journ. Ent., ii., p. 466; Macl., Proc. Linn. Soc. N. S. W., ii. (2), p. 670.

Hab. W. Australia—E. Wallaby Island in the Houtmann's Abrolhos Group, and Fremantle.

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The type of this species was from Champion Bay. *S. duboulaii* seems best placed in *Sympetes*, the prosternum being declivous behind and not received by the mesosternum. At roots of bent grass, on sandhills (Walker).

Saragus.

Saragus, Erichson, in Wiegmann's Archiv, 1842, 1, p. 171.

Saragus lævicollis.

Silpha lævicollis, Fabr., Syst. Ent., p. 73; Oliv., Ent., ii., 11, p. 12, t. 2, fig. 5.

Saragus lævicollis, Er., in Wiegmann's Archiv, 1842, 1, p. 172, t. 4, figs. 7, *a*, *b*; de Brême, Essai Monogr. Cossyph., i., p. 44, t. 3, fig. 1; Hope, Trans. Ent. Soc. Lond., 1848, p. 56, t. 7, fig. 5; Macl., Proc. Linn. Soc. N. S. W., ii. (2), p. 657.

Cilibe costatus, Sol., Studi Ent., p. 355, t. 13, figs. 10–13 (1848).

Hab. Tasmania—Hobart and Launceston.

Sandy places, under stones and at roots of herbage (Walker).

Saragus bicarinatus, n. sp. (Plate VIII., fig. 10.)

Moderately elongate, broad, convex, subparallel, very obtuse behind, brownish-black, opaque. Head deeply sunk into the prothorax (the eyes only just visible from above), thickly and finely punctate, the epistoma limited at the sides and posteriorly by a shallow groove; prothorax strongly transverse, deeply emarginate in front, the sides rapidly converging from the base, a little rounded anteriorly, the base slightly emarginate in the middle, rounded to the outer limit of the disc, and then very obliquely truncate to the acute, deflexed, posteriorly-produced hind angles, the anterior angles rather obtuse, the disc convex, obsoletely canaliculate in the middle, and very finely, closely punctate, with the interspaces (viewed under a strong lens) densely minutely punctured, the margins broadly, horizontally explanate, shagreened and minutely granulate, the exterior edge not reflexed; elytra about two and a half times longer than the prothorax, and of the same width at the base, parallel to about the middle, very obtuse behind, strongly trisinuate at the base, with subacute, deflexed,

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outwardly directed humeri, each elytron with three longitudinal equidistant costæ extending to considerably beyond the middle, the inner one stout, smooth, and shining, and strongly raised, the other two faint and slightly crenulate, the external one curving inwards at the base, the space between the first costa and the suture (which is not raised and slightly shining) quite flat, and between it and the lateral margin obliquely declivous, the interspaces shagreened and very minutely granulate, and with rows of subobsolete punctures, a row of coarser impressions midway between the outer costa and the margin, the margins moderately horizontally explanate, the exterior edge not thickened; the legs and under surface fusco-ferruginous; the prosternum granulate, longitudinally wrinkled at the sides, the prosternal process rugosely punctured, the latter subhorizontally produced, and received by the deeply excavate V-shaped mesosternum; the rest of the under surface thickly punctured and wrinkled, the pleuræ smoother; anterior tibiæ with a short fine tooth at the outer apical angle. Length 16¼, breadth 10 mm.

Hab. N.W. Australia—Roebuck Bay.

One specimen. Very near *S. confirmatus*, Pasc., from W. Australia, but much larger, broader, and more robust, the legs much stouter; the innermost costa on the elytra stouter, more raised, and shining, the other costæ faint (not being any more prominent than they are in *S. confirmatus*); the prothorax not wider than the elytra at the base. Another closely allied, perhaps undescribed, species, from Nicol Bay, is contained in Mr. F. Bates's collection. *S. bicarinatus* is apparently not described in MacLeay's monograph of the genus.

Saragus intricatus, n. sp.

Oblong-oval, very convex, black, subopaque. Head sparsely and very finely punctate, the interocular space more coarsely and more closely punctured; prothorax at the base more than twice as broad as long, broadly and very deeply emarginate in front, the sides rapidly and arcuately converging from the base, the base feebly emarginate in the middle, broadly rounded to the outer limit of the disc, and then very obliquely truncate to the sharp posteriorly-produced hind angles, the disc transversely convex, shallowly longitudinally grooved in the middle behind, and thickly, very finely punctate, the margins strongly horizontally explanate, and finely shagreened, the outer edge not reflexed, the anterior angles rounded; scutellum smooth; elytra slightly wider than,

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and three times as long as, the prothorax, parallel to about one-third from the base, arcuately and rapidly narrowing posteriorly, conjointly rounded at the apex, and with rather obtuse humeri, each elytron with three sinuous subequidistant feeble carinæ (the first straight and more sharply raised anteriorly), and with a still more feeble carina midway between each of these, all connected here and there by transverse or oblique rami, the interspaces with interrupted series of coarse, exceedingly shallow punctures, the space between the first costa and the suture (which is not raised) flat, the sides abruptly declivous, the margins very slightly dilated at the base; beneath very sparsely minutely punctate, and also longitudinally wrinkled, and clothed with a few scattered hairs; the prosternal process thickly punctured, strongly horizontally produced, and received by the deeply excavate V-shaped mesosternum; the femora very sparsely, the tibiæ closely and roughly, punctured, the anterior tibæ feebly toothed at the outer apical angle. Length 14½, breadth 9½ mm.

Hab. N.W. Australia—Adelaide River.

Three examples, two of which are contained in the British Museum. Apparently distinct from all the numerous described species of the genus. In the sculpture of the elytra it approaches *S. reticulatus*, Haag, from Endeavour River.

Saragus infelix.

Saragus infelix, Pasc., Journ. Ent., ii., p. 466.

Hab. Tasmania—Launceston.

One specimen of this species has been sent by Mr. Walker to the British Museum. The type was from Tasmania.

Saragus sp. (?).

Hab. N.W. Australia—Montalivet I.

One mutilated specimen (without head), perhaps belonging to an undescribed species, sent by Mr. Walker to the British Museum.

Saragus brunnipes.

Celibe brunnipes, Boisd., Voyage de l'Astrolabe, Ent., ii., p. 264.

Cilibe brunnipes, de Brême, Essai Monogr. Cossyph., i., p. 37, t. 3, fig. 4.

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Saragus brunnipes, Macl., Proc. Linn. Soc. N. S. W. (2), ii., p. 669.

Hab. W. Australia—Cape Leeuwin.

Three examples, probably belonging to this species. They closely resemble *S. macleayi*, Blackb., but are flatter, and have the expanded margins of the thorax and elytra ferruginous, and the humeri more angular.

Nyctozoilus.

Nyctozoilus, Guérin, Voy. Coquille, Ent. ii., p. 92 (1830).

Sphenogenius, Solier, Studi Ent., p. 35,

Nyctozoilus sexcostatus, n. sp. (Plate VIII., fig. 9.)

Oblong ovate, convex, rather broad, dull black, very sparsely clothed with exceedingly short, fine, appressed, yellowish-brown hairs. Head broad, slightly depressed in front, thickly and finely punctate, the epistoma feebly arcuate-emarginate at the apex, the antennary orbits prominent and extending more than half-way across the eyes; antennæ piceous, ferruginous at the tip, not reaching the base of the prothorax, thickening a little outwardly, joint 3 elongate, about two and a half times as long as 4, 4—7 decreasing slightly in length, 8 as broad as long, 9 and 10 strongly transverse, 11 twice as long as 10, rounded at the tip; prothorax transverse, widest at the middle, a little wider at the base than at the apex, moderately convex, with the sides flattened and horizontally explanate, the apex broadly and deeply emarginate, the base (viewed from behind) very broadly and feebly arcuate-emarginate, distinctly margined, the sides strongly rounded at the middle, obliquely converging anteriorly, and constricted and deeply sinuate before the base, the anterior angles sharp and very prominent, the hind angles obliquely produced behind and overlapping the elytra, the lateral margins, and the apical margin (except in the middle), feebly reflexed and slightly crenulate, the entire surface very minutely shagreened and with shallow, scattered, fine irregular punctures (each bearing a short hair), which are more crowded towards the middle of the disc, the latter with an indistinct median groove and a broad shallow depression on either side of it a little behind the middle; elytra very much wider than, and about twice as long as, the prothorax, a little rounded at the sides, strongly so at the base, each with three fine, sharp, slightly sinuous, smooth carinæ (the first and third almost confluent behind

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and enclosing the shorter median one, the first curving a little outwards, and the second and third curving a little inwards, at the base), the suture smooth and similarly raised, the interspaces very minutely shagreened, feebly transversely wrinkled, and with scattered fine setiferous punctures, which become coarser towards the sides; beneath blackish-brown, dull, more thickly pubescent (except at the sides), very minutely shagreened, and somewhat closely impressed with fine, muricate punctures, the propleuræ with widely scattered, simple, shallow punctures, each bearing a hair; prosternum very broad, horizontal, strongly produced, rounded at the tip; mesosternum broad, subangularly raised on either side in front; metasternum very short; intercoxal process exceedingly broad, subparallel, rounded in front; epipleuræ very broad at the base, gradually narrowing behind, and extending to the apex; legs pitchy-brown, rather slender, closely punctured. Length 14, breadth 7½ mm.

Hab. N. W. Australia—Adelaide River.

I am unable to identify this very distinct species with any of those described by F. Bates, Macleay, or Haag; it agrees with the type, *N. obesus*, Guér., in its structural characters. One specimen, found under a stone on a dry bank (Walker).

Hypaulax.

Hypaulax, F. Bates, Trans. Ent. Soc. Lond., 1868, p. 259, Nat. Hist. (4), xiii., p. 16.

Hypaulax ampliata.

Hypaulax ampliata, F. Bates, Am. and Mag. Nat. Hist. (4), xiii., p. 19.

Hab. N. W. Australia—Roebuck Bay.

Numerous examples, found under the dry bark of stumps, etc. Originally recorded from W. Australia.

Hypaulax iridescens.

Hypaulax iridescens, Blackb., Proc. Linn. Soc. N. S. W. (2), iii., p. 1433.

? *Platynotus insularis*, Hope, Proc. Ent. Soc. Lond., 1842, p. 77; Trans. Ent. Soc. Lond., 1845, p. 107.

Hab. N. W. Australia—Port Darwin, Adelaide River.

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Many specimens from these localities, varying in length from 9½—17 mm., agree very nearly with the Rev. T. Blackburn's description of *H. iridescens*, the original examples of which were obtained in the northern territory of S. Australia. The species is distinct from all those described by Mr. F. Bates. It is not improbable that this is the *Platynotus insularis*, Hope,* from Melville Island and Port Essington. I am unable to find the type of Hope's species in the Oxford museum. The hairy mentum is a mark of the male sex. Under loose bark and also under logs lying in dry places (Walker).

MENEPHILUS.

Menephilus, Mulsant, Col. Fr., Latig., p. 291 (1854).

The Australian species of this genus are found under dry bark and in dry rotten wood, according to Mr. Walker.

Menephilus longipennis.

Tenebrio longipennis, Hope, Proc. Ent. Soc. Lond., 1842, p. 79; Trans. Ent. Soc. Lond., 1845, p. 110.

Hab. Tasmania—Franklin, New Norfolk, George's Bay.

Originally recorded from Adelaide. I have examined Hope's type in the Oxford Museum.

Menephilus corvinus.

Tenebrio corvinus, Er. in Wiegmann's Archiv, 1842, 1, p. 175.

Tenebrio cyanipennis, Hope, Proc. Ent. Soc. Lond., 1842, p. 79; Trans. Ent. Soc. Lond., 1845, p. 111.

Hab. Tasmania—Launceston.

It is uncertain which name has priority, both having been published in 1842. Erichson's type was from Tasmania, that of Hope from Adelaide.

Menephilus colydioides.

Tenebrio colydioides, Er. in Wiegmann's Archiv, 1842, 1, p. 175.

Hab. Tasmania—Hobart, Launceston, and George's Bay.

Apparently a common insect in Tasmania.

* Incorrectly referred to *Cestrinus* by Pascoe and Gemminger & Harold.

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Menephilus ruficornis, n. sp.

♂. Moderately elongate, convex, shining, piceous or obscure castaneous, the head more or less ferruginous in front, the elytra violaceous, æneous with a violaceous lustre, or æneous; the antennæ rufo-testaceous; the under surface pitchy-brown or castaneous; the legs piceous with the knees and tarsi castaneous, or entirely castaneous. Head short, somewhat deeply sunk into the prothorax, coarsely, closely punctured between and behind the eyes, the punctures oblong in shape, the anterior portion much more finely punctate, the epistoma limited at the sides and behind by a rather deep groove; the eyes moderately large and prominent, coarsely faceted, the orbits impinging on them in front; antennæ moderately stout, thickening outwardly, scarcely reaching the base of the prothorax, joint 6 wider than 5, 7—11 perfoliate, much wider than 6, 8—10 strongly transverse, 11 twice as long as 10, bluntly rounded at the tip; prothorax convex, broader than long, very little wider at the base than at the apex, the sides sinuate behind and rounded anteriorly, the base strongly bisinuate, the hind angles rectangular, the anterior angles obtuse and declivous, the surface coarsely, closely punctured, the apex smoother; scutellum subtriangular, about as long as broad, faintly punctured; elytra about three times as long as, and considerably wider than, the prothorax, subparallel in their basal half, with rows of coarse subapproximate punctures placed upon rather shallow striæ, the punctures becoming finer towards the suture and coarser towards the sides, the interstices feebly convex, sparsely, very distinctly punctate; beneath shining, the flanks of the prothorax with coarse, scattered punctures, the ventral segments rather coarsely and moderately closely, the metasternum very sparsely and finely, punctate; prosternum slightly declivous and strongly produced behind the anterior coxæ, grooved on either side, the apex raised; epipleuræ extending as far as the last ventral suture, rather broad; tibiæ slightly curved, pubescent on the inner side towards the tip, the two hinder pairs feebly sinuous within, the anterior pair with their outer apical angles obtuse. Length 7—7½, breadth 2½ mm.

Hab. Tasmania—Hobart and George's Bay.

Three examples, apparently all males. Allied to *M. corvinus*, Er., and *M. cærulescens*, Haag, but much smaller than either of these species, with the head, thorax, and under-surface much more coarsely punctured, the frontal suture deeper, etc. The elytra vary in colour from violaceous to æneous. Found under bark (Walker).

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Meneristes.

Meneristes, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 150 (1869).
Asiris, Motschulsky, Bull. Mosc., xlv., 2, p. 24 (1872).

Pascoe states that this genus only differs from *Menephilus* in the following characters—"tibiæ calcaratæ, femora incrassata." He has overlooked the fact that the tibiæ in his typical species, *M. laticollis*, are very distinctly channelled on their outer edge; *M. servulus*, Pasc., has the tibiæ rounded on their outer edge, and it cannot be included in the same genus.

Meneristes australis.

Tenebrio australis, Boisd., Voyage de l'Astrolabe, Ent. ii., p. 254; Bless., Horæ Ent. Ross., i., p. 94.
Meneristes laticollis, Pasc., Ann. and Mag. Nat. Hist. (3), iv., p. 150, t. 11, fig. 2 (*nec* Boisd.).
Asiris angulicollis, Motsch., Bull. Mosc., xlv., 2, p. 30.

Hab. Tasmania—Hobart and Launceston.

Under *Eucalyptus* bark, common (Walker).

I am unable to follow Pascoe in regarding this species as the *Baryscelis laticollis* of Boisduval, though it may be the *Tenebrio australis* of that author. The Rev. T. Blackburn (Trans. R. Soc. S. Austr., x., p. 282) unites Boisduval's species under the one name, *Meneristes australis*; but to judge from the imperfect descriptions (Voy. de l'Astrolabe, ii., pp. 253, 254) they cannot possibly be synonymous. An insect sent me by Mr. Blackburn as the *Tenebrio australis*, Boisd., agrees with the type of *M. intermedius*, Pasc.; it differs from *M. laticollis* in its smaller size, and in having less acute hind angles to the prothorax.

Promethis.

Promethis, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 148 (1869).
Mederis, Motschulsky, Bull. Mosc., xlv., 2, p. 24 (1872).

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Promethis angulata.

Upis (*Iphthinus*) *angulatus*, Er. in Wiegmann's Archiv, 1842, 1, p. 174.
Promethis angulata, Pasc., *loc. cit.*

Hab. Tasmania—Hobart and New Norfolk.

Previously recorded from Tasmania and Victoria. Under *Eucalyptus* bark, generally in company with *Meneristes* (Walker).

LEPISPILUS.

Pachycœlia, Boisduval, Voyage de l'Astrolabe, Ent. ii., p. 248 (1835) (nomen præocc.).
Lepispilus, Westwood, Arcana Ent., i., p. 44 (1841).

Lepispilus sulcicollis.

Pachycœlia sulcicollis, Boisd., Voyage de l'Astrolabe, Ent. ii., p. 248.
Helops sulcicollis, Boisd., *loc. cit.*, p. 268, t. 7, fig. 5.
Lepispilus sulcicollis, Westw., Arcana Ent., i., p. 44, t. 12, fig. 4; Blanch., in Dumont d'Urville's Voyage au Pole Sud, iv., p. 172, t. 11, fig. 14.

Hab. Tasmania—George's Bay and Hobart.

Originally described from Tasmania. To judge from the type, *L. stygianus*, Pasc., appears to me to be nothing more than a worn (female) example of the same species. Found on foliage and by sweeping low plants (Walker).

OMOLIPUS.

Omolipus, Pascoe, Journ. Ent., i., p. 127 (1860).

Omolipus oblongus.

Omolipus oblongus, F. Bates, Trans. Ent. Soc. Lond., 1873, p. 379.

Hab. W. Australia—Cossack.

Found in plenty by Mr. Walker in sandy places on the seashore, at roots of bent grass. These specimens differ from the mainland type in their smaller size, more shining surface, and more obsoletely striate elytra; but I do not think they represent more than a local form of *O. oblongus*. The type is from Champion Bay.

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Omolipus cyaneipennis, n. sp. (Plate VIII., fig. 12, ♂.)

Moderately elongate, obovate, black, the elytra cyaneous or cyaneo-violaceous, the entire upper surface subopaque. Head very minutely and sparsely punctured, the epistoma separated from the front by a fine impressed line, the eyes small; antennæ black, about reaching the base of the prothorax, thickening outwardly, the penultimate joints transverse, the apical one twice as long as the tenth; prothorax broader than long, moderately convex, very finely margined at the sides, more distinctly so at the base, the sides rounded anteriorly, obliquely converging behind, and feebly sinuate just before the base, the hind angles distinct, the surface still more minutely and more sparsely punctured than that of the head (the punctures only visible under a strong lens); elytra about twice as long as the prothorax, and a little wider than it at the base, sharply margined at the sides and with the humeri rather prominent, widest about the middle and then rapidly narrowing to the apex, punctate-striate—the striæ shallow, the punctures oblong in shape, not very coarse, and rather closely placed, and becoming finer towards the apex,—the interstices smooth and slightly convex; beneath dull pitchy-black, the two basal segments of the abdomen with a faint cyaneous lustre, the apical two or three segments slightly shining, the venter sparsely and very minutely punctured; the prosternum canaliculate on either side, and declivous behind, the apex conically raised; legs black, shining; the anterior tarsi slightly dilated in the male. Length 5½—8½, breadth 2½—3½ mm. (♂ ♀).

Hab. N. W. Australia—Baudin Island.

This beautiful species was found in some numbers by Mr. Walker, under fragments of ironstone on the summit of the island, at an elevation of about 250 feet, in company with *Ectyche cærulea*. The island upon which it occurred was named by the officers of H.M.S. "Penguin," during their surveying expedition to the coast of N. W. Australia. *O. cyaneus*, Pasc., is an allied form.

Omolipus parvus.

Omolipus parvus, F. Bates, Trans. Ent. Soc. Lond., 1873, p. 379.

Hab. W. Australia—Fremantle.

A single male example, agreeing perfectly with the type; the latter is from Swan River.

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Decialma.

Decialma, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 291 (1869).

Decialma erichsoni, n. sp. (Plate VIII., fig. 11.)

Decialma erichsoni, F. Bates, in litt.

♂. Moderately elongate, black, the upper surface with a cæruleous lustre, shining, glabrous. Head coarsely, rugosely punctured, the vertex with a small transverse impunctate space in the middle; antennæ pitchy-brown, slender, extending to a little beyond the base of the prothorax, joint 3 nearly as long as 4 and 5 united, 9 and 10 a little longer than broad, obconic, 11 one-half longer than 10, bluntly rounded at the tip; prothorax short, very strongly transverse, convex on the disc, broadly and deeply depressed towards the sides, with a large broad space between the middle and the base more deeply excavate, the lateral margins explanate and strongly upturned, the sides feebly rounded, slightly convergent at the base and more distinctly so in front, the apex very broadly truncate in the middle, the anterior angles rounded, strongly, very broadly produced, the base deeply bisinuate, the hind angles subrectangular, the surface thickly, moderately finely punctate, a median line on the disc and the lateral portion anteriorly almost smooth; scutellum smooth; elytra considerably broader than, and about four times as long as, the prothorax, subparallel in their basal half, moderately convex, thickly, irregularly, and rather coarsely punctate (the punctures becoming much finer at the apex), and with indications of irregular faint raised lines; beneath very shining, the metasternum at the sides and the adjacent part of the epipleura with coarse scattered punctures, the flanks of the prothorax feebly wrinkled, the sides of the ventral segments longitudinally wrinkled and with a few scattered punctures, the median part closely and more finely punctured; prosternum horizontal, very strongly, convexly produced behind, and received by the exceedingly deeply excavate mesosternum, the latter U-shaped, horizontal, with the strongly raised sides vertical in front; legs pitchy-black, the tarsi paler; anterior tarsi slender; hind tibiæ on the inner side subangularly widened at about one-fourth from the base and slightly sinuous. Length 10½, breadth 4⅓ mm.

Hab. Tasmania—Denison Gorge, near Launceston.

Specimens of this insect are also contained in Mr. F. Bates's collection, labelled with the name I have adopted.

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One specimen, found under bark of [illegible]. The genus [illegible], Pasc., is probably not distinct from [illegible], Er.

Titæna.

Titæna, Erichson, in Wiegmann's Archiv, 1842, 1, p. 178; F. Bates, Ann. and Mag. Nat. Hist. (4), xiii., p. 102.

Titæna columbina.

Titæna columbina, Er., in Wiegmann's Archiv, 1842, 1, p. 179, t. 4, figs. 9, *a*, *b*; Blanch., in Dumont d'Urville's Voyage au Pole Sud, iv., Ins., p. 178.

Strongylium rugosum, Blanch., *loc. cit.*, t. 12, fig. 2.

Hab. Tasmania—Hobart, Launceston, and Franklin.

Not uncommon, under bark of *Acacia decurrens* and *A. dealbata*, locally known as wattle-trees.

Titæna alcyonea.

Titæna alcyonea, Er., in Wiegm. Archiv, 1842, 1, p. 180.

Hab. Tasmania—Hobart.

One specimen; also sent by Mr. Walker to the British Museum. Examples of this insect are separated from *T. alcyonea*, Er., in Mr. F. Bates's Collection and labelled with the MS. name of *cyanea*, Bates; Mr. Walker's insect, however, accurately fits Erichson's description.

Titæna tasmanica, n. sp. (Plate VIII., fig. 13.)

Titæna tasmanica, F. Bates, in litt.

Elongate, narrow, very convex, æneous or cupreo-æneous, the head and prothorax usually of a greener tint, glabrous, the antennæ and legs rufous or pitchy-red. Head coarsely, confluently punctured, the punctures on the epistoma finer and separate one from another; prothorax very convex, as long as broad, widest at the middle, about equal in width at the base and apex, the apex truncate, the base rounded at the middle and feebly sinuate on either side, the sides a little rounded in front and slightly converging behind, the anterior angles deflexed and obtuse, the surface coarsely and densely punctured, the punctures here and there longitudinally confluent; elytra rather more than three times as

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long as, and considerably wider than, the prothorax, a little narrowed in front, closely and very coarsely punctured, the punctures variolose, here and there transversely confluent, and arranged in irregular, closely packed, longitudinal series; beneath pitchy-brown, very coarsely punctured, the ventral segments more finely punctured in the middle. Length 6—6½, breadth 2¼ mm.

Hab. Tasmania—Launceston and Hobart.

Specimens of this insect are also contained in Mr. F. Bates's Collection, where they are labelled with the name here adopted. Much smaller, shorter, and less parallel than *T. columbina* or *T. alcyonea*, Er., the upper and under surfaces glabrous. Found in rotten wood, old posts, etc. (Walker).

Melytra.

Melytra, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 34 (1869).

Melytra ovata.

Melytra ovata, Pascoe, *loc. cit.*, t. 10, figs. 1, 1*a*, *b*.

Hab. Tasmania—Hobart.

Hymæa.

Hymæa, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 35 (1869).

Hymæa succinifera.

Hymæa succinifera, Pascoe, *loc. cit.*, p. 36, t. 10, figs. 3, 3*a*, *b*.

Hab. Tasmania—Launceston and Hobart.

Under bark of *Atherosperma moschatum* and *Eucalyptus coccifera*, at elevations above 2,500 feet (Walker).

Ectyche.

Ectyche, Pascoe, Ann. and Mag. Nat. Hist. (4), iv., p. 143 (1869).

Ectyche cærulea, n. sp. (Plate VIII., fig. 15, ♂.)

Cæruleous or violaceous; the head and thorax dull, the elytra shining and of a brighter metallic colour; the upper surface clothed

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with very long, erect blackish hairs, those on the elytra serially arranged and arising from the interstitial punctures. Head impressed with oblong, rather coarse, scattered punctures, the epistoma separated from the front by an impressed line, the eyes strongly transverse; antennæ pitchy-brown, hairy, extending a little beyond the base of the prothorax, thickening a little outwardly, the joints perfoliate and submoniliform, 3—7 moderately elongate, 8—11 shorter, 11 stouter than 10; prothorax feebly transversely convex, strongly transverse, as broad as the elytra, widest at the middle, the sides greatly rounded, explanate, and abruptly notched immediately before the base, the entire surface with scattered, oblong, coarse setiferous punctures, between which are some very much finer and shallower non-setiferous impressions, the disc with traces of a smooth space down the middle; elytra more than twice as long as the prothorax, ovate, parallel anteriorly, coarsely crenate-striate, the punctures becoming finer towards the apex, and not very closely placed, the interstices moderately convex, each with a row of scattered, fine, transverse, setiferous impressions, the base truncate, the humeri obtuse; beneath pitchy-black, very shining, with widely scattered, rather coarse setiferous punctures; legs piceous or brownish, hairy, with intermixed much longer erect hairs.

♂ The anterior tibiæ with the single spur at the inner apical angle longer and sharper, the anterior and intermediate pairs more curved; the first ventral segment triangularly depressed in the middle behind. Length 7—8 mm. (♂ ♀)

Hab. N. W. Australia—Parry Harbour, Troughton I., Baudin I., Condillac I.

Easily known from the allied forms by its large size and the bluish colour of the upper surface. *E. scabripennis*, F. Bates, from Nicol Bay, is also a large species, but differs from it in many respects, apart from colour. Not rare, under large fragments of ironstone on the summits of Baudin and Condillac Islands (Walker).

Ectyche erebea.

Ectyche erebea, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 144, t. 11, figs. 1, 1*a*, *b*.

Hab. W. Australia—Fremantle.

Originally described from the same locality. *E. sculpturata*, F. Bates, from Nicol Bay, approaches this species very closely.

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MICRECTYCHE.

Micrectyche, F. Bates, Trans. Ent. Soc. Lond., 1873, p. 362.

These insects are found at the roots of low plants on sandy beaches, according to Mr. Walker.

Micrectyche intermedia.

Micrectyche intermedia, F. Bates, *loc. cit.*, p. 363.

Hab. W. Australia—E. Wallaby Island in the Houtmann's Abrolhos Group.

One specimen, agreeing perfectly with the type from Champion Bay.

Micrectyche ferruginea.

Micrectyche ferruginea, F. Bates, *loc. cit.*, p. 364.

Hab. W. Australia—Fremantle.

Three specimens. The type is stated to be from Swan River.

PHÆNNIS, n. gen.

Head short and broad, sunk into the prothorax up to the eyes, with the sides of the front obliquely converging and not at all prominent (not projecting over the points of insertion of the antennæ); the epistoma very short, truncate at the apex, limited behind by a shallow groove; labrum prominent, separated from the epistoma by a coriaceous space; the eyes small, transverse, moderately prominent, rather finely faceted, feebly emarginate; last joint of the maxillary palpi ovate; antennæ hairy, moderately slender, extending to a little beyond the base of the elytra, joints 1—8 more or less ovate, 1 stout, 2 about as long as 4, 3 nearly as long as 4 and 5 united, 4—8 equal in thickness but gradually decreasing in length, 9 nearly twice as long as, and very much wider than, 8, triangular, longer than broad, 10 triangular, as broad as long, 11 oval, narrower than 10, blunt at the tip; prothorax transversely cordate, subtruncate in front and behind, coarsely, irregularly dentate at the sides, the latter slightly expanded; scutellum strongly transverse, transversely convex; elytra fully one-half broader than, and about three times the length of, the prothorax, truncate at the base, parallel in their basal half, each with ten rows of coarse deep punctures; anterior coxal cavities closed behind; legs rather short,

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hairy, moderately slender, the penultimate joint of all the tarsi small, simple, the tarsi clothed with long hairs beneath, the first joint of the hind pair not longer than the following two joints united, the tibial spurs short but distinct; the upper surface clothed with long, erect bristly hairs, with intermixed short, appressed, fine hairs, the latter forming well-defined patches on the elytra.

This genus is proposed for a single species from Tasmania. It seems to be best placed near *Ectyche*. The clothing of the upper surface resembles that of the "Amphidorides," except that the finer hairs on the elytra form well-defined patches. The form of the antennæ is peculiar—the ninth to the eleventh joints being stouter than those preceding, the ninth and tenth triangular, the ninth longer than the eighth or tenth.

Phænnis fasciculata, n. sp. (Plate VIII., fig. 14.)

♀. Moderately elongate, rather convex, pitchy-brown, the front of the head and the anterior margin of the prothorax paler; the elytra with an oblong humeral patch and the suture indeterminately testaceous, the interstices also paler towards the base; the antennæ fusco-testaceous, with the three apical joints piceous; the legs fusco-testaceous, with the femora darker towards the base; the upper surface sparsely clothed with long, erect, bristly, brownish hairs, which are serially arranged on the elytra, and with intermixed short, appressed, yellowish-cinereous hairs, the latter forming well-defined patches on the elytra; the legs and antennæ clothed with long, fine, bristly hairs. Head thickly, shallowly punctate; prothorax transversely cordate, much narrower at the base than at the apex, transversely convex, coarsely and irregularly dentate at the sides (with about six teeth on each side), the surface thickly covered with coarse, rounded, very shallow punctures; elytra parallel to beyond the middle, flattened on the disc, with rows of coarse, deep, closely placed punctures, the punctures subtransverse on the disc, rounded towards the sides, the interstices narrow, sparsely, very minutely punctate, the third, fifth, and seventh subcostate. Length 4½, breadth 1¾ mm.

Hab. Tasmania—Hobart.

Of this species Mr. Walker has sent three specimens to the British Museum, and one to myself; the description is entirely taken from the latter. They were all found under the bark of *Eucalyptus*.

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CORIPERA.

Coripera, Pascoe, Journ. Ent., ii., p. 483 (1868); F. Bates, Ann. and Mag. Nat. Hist. (4), xiii., p. 112.

The name *Pseudhelops*, Guér., is incorrectly adopted for this genus in the Munich Catalogue, *cf.* F. Bates, *op. cit.*

Coripera deplanata.

Adelium deplanatum, Boisd., Voyage de l'Astrolabe, Ent. ii., p. 277, Ins., t. 7, fig. 6 (1835).

Hab. Tasmania—Launceston and Hobart.

Not uncommon. Under logs and stones in rather damp places, especially between 2000 and 4000 feet elevation, on Mount Wellington (Walker).

ADELIUM.

Adelium, Kirby, Trans. Linn. Soc., xii., p. 420 (1818).

Adelium licinoides.

Adelium licinoides, Kirby, Trans. Linn. Soc., xii., p. 421; Boisd., Voyage de l'Astrolabe, Ent. ii., p. 276.
Adelium cisteloides, Er. in Wiegmann's Archiv, 1842, 1, p. 176; Blessig, Horæ Ent. Ross., i., p. 101.

Hab. Tasmania—Hobart, Launceston, and Franklin.

Not uncommon. Erichson's *A. cisteloides* was from Tasmania.

Adelium vicarium.

Adelium vicarium, Pasc., Journ. Ent., ii., p. 480.

Hab. W. Australia—Darlington.

Two specimens, apparently belonging to this species; they are much larger than the type.

Adelium scytalicum.

Adelium scytalicum, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 137.

Hab. W. Australia—Fremantle.

Three specimens, perhaps referable to this species, from the type of which they differ in their less shining thorax and elytra. Described from Swan River.

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Adelium abbreviatum.

Adelium abbreviatum, Boisd., Voyage de l'Astrolabe, Ent. ii., p. 281.

Adelium impressum, Blanch. in Dumont d'Urville's Voyage au Pole Sud, iv., Ins., p. 177, t. 11, fig. 18.

Hab. Tasmania—Hobart, Launceston, and Franklin.

Not uncommon. Ascends to 4,000 feet on Mount Wellington (Walker).

Adelium latum.

Adelium latum, Pasc., Journ. Ent., ii., p. 482.

Hab. Tasmania—Launceston.

Four specimens, agreeing with the type. This species is a very close ally of *A. abbreviatum*, but it has the thorax more convex and with more obtuse hind angles.

Adelium brevicorne.

Adelium brevicorne, Blessig, Horæ Ent. Ross., i., p. 101, t. 3, fig. 2.

Adelium neophyta, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 136.

Hab. S. Australia—Port Adelaide.

Numerous examples.

Adelium porcatum.

Carabus porcatus, Fabr., Syst. Ent., p. 239; Ent. Syst., i., p. 147; Oliv., Ent., iii., 35, p. 37, t. 7, fig. 84.

Calosoma porculatum, Fabr., Syst. Eleuth., i., p. 211.

Adelium caraboides, Kirby, Trans. Linn. Soc., xii., p. 466, t. 23, fig. 7; Boisd., Voyage de l'Astrolabe, Ent. ii., p. 274.

Hab. Tasmania—Hobart.

Adelium strigipenne.

Adelium (*Seirotrana*) *strigipenne*, F. Bates, Trans. Ent. Soc. Lond., 1873, p. 365.

Hab. N. W. Australia—Adelaide River.

Three specimens, apparently referable to this species, and differing a little *inter se* in the intricate elytral sculpture. The type of *A. strigipenne*, which I have examined, is labelled "Australia."

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Adelium sp. (?)

Hab. W. Australia—Albany.

One specimen, perhaps an extreme form of *A. lindense*, Blackb., from Port Lincoln.

Adelium commodum.

Adelium commodum, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 139.

Hab. Tasmania—Hobart and New Norfolk.

Not uncommon. Described from Tasmania. The entire upper surface is brassy in all the specimens received, Pascoe describes the insect as black, with the elytra æneous.

Adelium tasmanicum, n. sp.

Rather elongate, narrow, moderately convex, black or pitchy-brown, with a brassy lustre, feebly shining; the oral organs, antennæ, the base of the tibiæ, and the tarsi and coxæ ferruginous. Head broadly flattened anteriorly, thickly and finely punctured, the epistoma arcuate-emarginate in front and limited behind by a well-defined groove; antennæ rather elongate in the male, about reaching the base of the prothorax in the female, the penultimate joints transverse, the apical one stout; prothorax as long as broad, truncate in front (as viewed from above), broadly and feebly emarginate at the base, slightly narrower at the base than at the apex, the sides a little rounded anteriorly, gradually and somewhat obliquely converging behind, the anterior angles rounded and declivous, the hind angles obtusely rectangular, the base obliquely foveate on either side, the surface closely, finely, distinctly punctured, and with a few widely-scattered setiferous impressions; elytra about two and one-third times as long as the prothorax, and wider than it, feebly rounded at the sides, which are sharply margined anteriorly, a little flattened on the disc, with rows of fine, distinct, approximate punctures placed upon almost obsolete striæ, the interstices flat, thickly and minutely punctured, the second, fourth, sixth, and eighth with a few widely scattered setiferous impressions, the humeri very obtuse; beneath thickly and finely punctured; anterior tarsi with the four basal joints moderately widened in the male. Length 7½—10, breadth 3—3½ mm.

Hab. Tasmania—Hobart and Launceston.

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Three examples. Closely allied to *A. commodum*, Pasc., and occurring at the same localities, but differing from it in having the thorax closely and distinctly punctured, the elytra with rows of fine but distinct punctures placed upon almost obsolete striæ (in *A. commodum* the striæ are sharply cut and indistinctly punctured); the setiferous punctures on the elytra are less distinct than in *A. commodum*, and placed on the second, fourth, sixth, and eighth, instead of on the third, fifth, seventh, and ninth interstices.

Adelium nodulosum, n. sp.

♀. Rather elongate, narrow, moderately convex, pitchy-brown, the elytra obscure castaneous in their outer half, the entire upper surface with a brassy lustre and feebly shining; the oral organs, antennæ, the base of the tibiæ, and the tarsi ferruginous. Head somewhat flattened anteriorly, thickly and moderately finely punctured, the epistoma feebly arcuate-emarginate in front and limited behind by a well-defined groove; antennæ extending to a little beyond the base of the prothorax, the penultimate joints as long as broad; prothorax as in *A. tasmanicum*, but more densely and more distinctly punctured; elytra as in *A. tasmanicum*, but less rounded at the shoulders, with rows of fine, distinct, approximate punctures placed upon almost obsolete striæ, the interstices flat, thickly, very distinctly punctate, and each with a series of feeble nodular elevations, which become more distinct and subtuberculiform towards the apex. Length 8½, breadth 3⅓ mm.

Hab. Tasmania—Launceston.

One example. This insect closely resembles *A. tasmanicum*, but differs from it in the denser punctuation of the thorax, and in having a series of rather closely placed nodular elevations on each of the elytral interstices, these elevations becoming tuberculiform at the apex. From *Brycopia tuberculifera* (which has somewhat similar, but fewer, elevations on the elytra) it may be known by the more transverse and less prominent eyes, the much finer punctures of the elytral striæ, the coarser punctures of the interstices, etc. The elytra are subtruncate at the base.

DINORIA.

Dinoria, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 141 (1869).

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Dinoria picta.

Dinoria picta, Pasc., *loc. cit.*

Hab. Tasmania—Hobart.

Apparently a common insect at Hobart. Under bark and among chips in damp situations (Walker).

Dinoria cælioides.

Dinoria cælioides, Pasc., Ann. and Mag. Nat. Hist. (4), v., p. 103.

Hab. Tasmania—Hobart.

Originally recorded from Queensland. Same habits as *D. picta* (Walker).

BRYCOPIA.

Brycopia, Pascoe, Ann. and Mag. Nat. Hist. (4), iii., p. 141 (1869).

Brycopia tuberculifera, n. sp.

Brycopia tuberculifera, F. Bates, in litt.

Moderately elongate, rather narrow, convex, pitchy-black with an æneous lustre, shining; the oral organs and antennæ ferruginous, the basal joints of the latter usually darker; the legs pitchy-brown, the tarsi ferruginous. Head sparsely, finely, irregularly punctate, and also with a few coarse setiferous impressions in front, the epistoma not clearly defined, feebly arcuate-emarginate in front, and limited behind by a rather broad transverse depression; the eyes moderately large, coarsely granulated, convex, prominent, rounded as seen from above; antennæ rather elongate, thickening outwardly, the apical joint very stout; prothorax subquadrate, convex, as long as broad, subtruncate in front (as viewed from above), feebly bisinuate at the base, the sides moderately rounded anteriorly and sinuous and converging behind, the hind angles acute, the anterior angles obtuse and declivous, the base obliquely depressed and foveate towards the sides, the surface very finely and rather closely punctured, and with a few coarse, deep, widely scattered setiferous impressions; elytra about two and one-third times as long as the prothorax, and wider than it, somewhat oval, with rows of moderately coarse, subapproximate punctures placed upon almost obsolete striæ, the interstices flat, sparsely, finely punctate, and with scattered, feeble tubercular prominences,

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which become more distinct towards the sides and apex, the third, fifth, and seventh each with three or four setiferous impressions, the humeri very obtuse. Length 8¾—9¼, breadth 3¼—3½ mm.

Hab. Tasmania—Hobart, Launceston, and Franklin.

Four specimens have been sent to me by Mr. Walker, and others are contained in Mr. F. Bates's collection, the latter bearing the name I have adopted. *B. tuberculifera* has very much the facies of *Adelium commodum*, Pasc., an insect occurring in the same localities; but it may be easily known from that insect by the prominent and more rounded eyes, the imperfectly defined epistoma, the tuberculate elytra, etc.

Chalcopterus.

Chalcopterus, Blessig, Horæ Ent. Ross., i., 1, p. 103 (1861); Blackburn, Proc. Linn. Soc. N.S.W. (2), vii., p. 415 (1892), and viii., pp. 53—56 (1893).

Chalcopterus longipennis.

Amarygmus longipennis, Hope, Proc. Ent. Soc. Lond., 1842, p. 79; Trans. Ent. Soc. Lond., 1845, p. 109 (? *nec* Blackburn).

Hab. W. Australia—Fremantle.

One specimen, also another in the British Museum-set, agreeing with Hope's type. The Rev. T. Blackburn in his description of this species (Proc. Linn. Soc. N.S.W. (2) vii., p. 456) states that the tarsi are clothed with black hairs beneath; in the insect before me the hairs are fulvous, but as I did not examine the tarsi of Hope's type, the identification with his *C. longipennis* is perhaps not quite certain.

Chalcopterus howitti.

Amarygmus howitti, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 348.

Chalcopterus cupripennis, Blackb., Proc. Linn. Soc. N.S.W. (2), vii., p. 422 (nec Hope).

Hab. Tasmania—Hobart.

Not hitherto recorded, I believe, from Tasmania. It is a common species in Southern Australia.

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Chalcopterus iridicolor.

Chalcopterus iridicolor, Bless., Horæ Ent. Ross., i., p. 107, t. 4, figs. 3, 6 (1861); Blackb., Proc. Linn. Soc. N.S.W. (2) viii., p. 67.

Hab. Tasmania—Hobart.

I refer with some doubt a very variable *Chalcopterus* obtained in plenty in Tasmania by Mr. Walker to this species, the type of which was from Melbourne. The Rev. T. Blackburn in his recent papers on the genus *Chalcopterus* does not mention any species specially as from Tasmania.

Chalcopterus semiticus.

Amarygmus semiticus, Pasc., Ann. and Mag. Nat. Hist. (4), iii., p. 349 (1869).

Hab. N. Australia—Cape Bougainville.

One specimen of this species has been sent by Mr. Walker to the British Museum. It agrees well with the type from Port Denison. *C. semiticus* is apparently unknown to Mr. Blackburn (*cf.* Proc. Linn. Soc. N.S.W. (2), viii., p. 69).

AMARYGMUS.

Amarygmus, Dalman, Anal. Ent., p. 60 (1823) (partim); Blackburn, Proc. Linn. Soc. N.S.W. (2), vii., p. 415 (1892), and viii., p. 87.

Amarygmus tyrrhenus.

Amarygmus tyrrhenus, Pasc., Ann. and Mag. Nat. Hist. (4), v., p. 105; Blackb., Proc. Linn. Soc. N.S.W. (2), viii., p. 91.

Hab. W. Australia—Albany.

One specimen.

Amarygmus perplexus.

Amarygmus perplexus, Blackb., Proc. Linn. Soc. N.S.W. (2), viii., p. 102 (1893).

Hab. N. and N. W. Australia—Port Darwin, Adelaide River, Roebuck Bay.

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Sent in plenty by Mr. Walker. The numerous specimens from Adelaide River have the elytra more or less cyaneous, instead of black, as in the type and in the examples from Port Darwin. Mr. Blackburn's specimens were from the North Territory of S. Australia; he has examined some of Mr. Walker's examples.

Explanation of Plate VIII.

Fig. 1. *Diphyrrhynchus ellipticus*, ♂.
2. *Ennebœus australis*.
2*a*. „ „ antennæ.
3. *Ennebœopsis pruinosus*.
3*a*. „ „ antennæ.
4. *Diphyrrhynchus apicalis*, ♂.
5. *Edylius canescens*, ♂.
5*a*. „ „ labium.
5*b*. „ „ maxilla and maxillary palpus.
6. *Lyphia tasmanica*.
7. *Caanthus gibbicollis*.
7*a*. „ „ maxilla and maxillary palpus.
7*b*. „ „ antennæ.
8. *Paratoxicum iridescens*.
8*a*. „ „ maxilla and maxillary palpus.
8*b*. „ „ labium.
8*c*. „ „ antennæ.
9. *Nyctozoilus sexcostatus*.
10. *Saragus bicarinatus*.
11. *Decialma erichsoni*.
12. *Omolipus cyaneipennis*, ♂.
13. *Titæna tasmanica*.
14. *Phœnnis fasciculata*.
15. *Ectyche cærulea*, ♂.

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1.

2

3.

4.

5a.

2a.

3a.

8c.

8a.

5.

6.

7b.

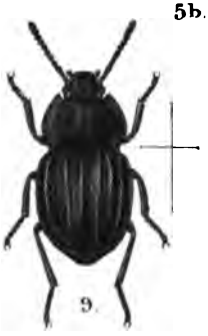
7.

8.

5b.

7a.

8b.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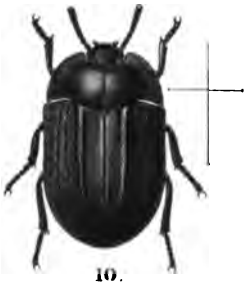
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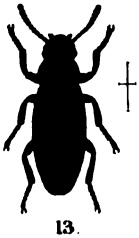
12.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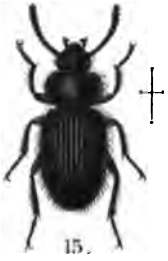
15.

W Purkiss del et lith.

Mintern Bros. imp.

Tenebrionidæ
from Australia & Tasmania.

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XII. *Description of the Larva and Pupa of* Papilio homerus, Fab. By Charles B. Taylor, F.E.S.

[Read February 28th, 1894.]

About two or three years ago, a lady residing in the Bath district of the Parish of Saint Thomas, and a diligent collector of insects, discovered seven examples of a large Caterpillar of a beautiful green colour, on a tree bearing large subovate glossy green leaves (botanical name unknown) growing near a certain locality known as the "Fountain Road." Of these she was good enough to send me four specimens, which unfortunately, however, never reached my hands, as they were lost in transit, while I shortly afterwards heard that the other three examples had died before assuming the pupal state, as a result of confinement and want of proper attention. Towards the middle of last year Mrs. Swainson found another of these Caterpillars, which she sent down to the Museum of the Jamaica Institute for identification. It arrived at a time when there was no experienced Entomologist in charge (the post of Curator being then temporarily vacant), but on seeing it I ventured to express the belief that it was the larva of *P. homerus*. This individual also died during the process of casting the larval skin. Through the kindness of Lady Blake I was enabled to make a special expedition to Bath during November last, in search of this larva, and the day after my arrival (the 27th) had the good fortune to find an almost full-fed specimen, which developed a male *homerus* on the 29th of December following. It is worthy of note that all these Caterpillars were obtained from the same tree, notwithstanding that there were many others of the same species in the immediate neighbourhood.

Larva. Length about 2¼ inches, general appearance incrassated, the body being thickest from the 3rd to the 5th segments, from

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thence tapering gradually to the anal extremity, which is abruptly truncated. Head small, pale ochreous or brown, deflected, and, when the larva is at rest, almost completely obscured by a projection of the anterior margin of the 1st segment.

Colour protective, harmonizing closely with the tint of the leaf of the food plant. Upper surface a rich deep chrome-green extending down to about the spiracular region, where it terminates with a more or less irregular or sinuous outline, most pronounced towards the posterior segments, where the green is sharply divided from the colour of the under surface by a narrow edging of white. 1st segment with a short transverse dorsal bar of pale dun or ochreous brown; a broad, curved band of the same colour, bearing a few lines and spots of black, runs in a posterior direction across the dorsal surface of the 3rd segment, and down to the sides of the 4th segment, where, curving slightly upwards, it ends in club-shaped dilations, enclosing a simple ocellus coloured as follows: On a comma-shaped ground patch of black is drawn a rather broad ring of dun, bordered below with bluish-grey followed by a black iris, with a bluish-white pupil. Across the posterior margin of the 5th segment is drawn a most conspicuous luniform stripe of white, having a raised appearance, as if laid on with several coats of body colour, and which is in turn marked with little transverse bars of pale lavender, five in all; the horns of the crescent have this time a slightly anterior direction, and terminate at the sides between the 4th and 5th segments just at the junction of the green with the brown of the under surface.

Anterior margin of the fifth segment, immediately in front of the white stripe, finely irrorated with white; between the 5th and 6th segments is a broad transverse band of deep black, more or less completely hidden by the segmental fold, except when the larva is in motion, when it is very conspicuous. Ventral surface, including abdominal legs, dull dark brown. A broad band of this colour, suffused with a lavender-grey tint, bearing a few scattered spots of blue-grey, and having a very irregular or jagged outline, is continued obliquely upwards in a posterior direction from the 8th segment, and, meeting on the dorsal surface of the 10th segment, descends again, obliquely, narrowing rapidly however before joining the brown of the under surface, thus enclosing an irregular diamond-shaped patch of green. Segmental folds strongly marked on the ventral surface.

Pupa, of usual shape, not greatly angulated. Colour, wholly dark wood-brown, with two pairs of white tubercles on the dorsal surface of the middle abdominal segments.

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XIII. *Notes on* Dorydium (?) westwoodi, *Buchanan White, with observations on the use of the name Dorydium.* By William F. Kirby, F.L.S., F.E.S., Assistant in Zoological Department, British Museum (Nat. Hist.), South Kensington.

[Read February 28th, 1894.]

A few days ago I received a letter from Mr. Herbert Clark, of Christchurch, New Zealand, enclosing two specimens of a very curious Homopterous insect, which I have succeeded in identifying with *Dorydium westwoodi*, Buchanan White.

Mr. Clark writes, "I found it on the rushes which grow in damp situations. In colour and shape it so much resembles a piece of dried rush that I have never been able to find a specimen except by switching the net amongst them. I think they are scarce and very local, as the specimens I have captured were taken in a space a few yards square, and I have never been able to collect them elsewhere. The place where they were found was in a plantation of *Pinus insignis* about a quarter of a mile from the sea, and a few chains from the river. The time of appearance is from the beginning of November to the end of the year."

The insect belongs to the family *Jassidæ*, and the references are as follows:

Dorydium westwoodi.

Buchanan White, Ent. M. Mag., xv., p. 215 (1879); Signoret, Ann. Soc. Ent. France (5), x., p. 43, pl. 1, fig. 38, details (1880).

One of the specimens received from Mr. Clark is a perfect insect (a male, I think), and the other a pupa, as may be seen by the rudimentary tegmina. The mature specimen measures 9 lines in length, and agrees with

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Buchanan White's description better than with Signoret's, except in size (Signoret gives 11 mm., and Buchanan White 14). The insect is probably variable in size and markings, or in the absence of markings, or there may be more than one allied species; without a good series, and perhaps observation of the living insects, it might be difficult to clear up this point.

Buchanan White received three specimens from Wakefield, which had been taken by Fereday near Christchurch. He remarks, "This curious species strongly resembles the seed of one of the larger grasses."

Signoret received his specimens from John Scott; they appear to be darker than the types; but the allied Australian species described by G. R. Waterhouse (Trans. Ent. Soc., ii., p. 195) under the genus *Cephalelus*, differ much in size and colour. They differ, too, from the species referred to *Dorydium* by the longer and more tapering frontal prominence.

There is a curious confusion relating to the genera *Cephalelus* and *Dorydium* which I will try to clear up. In 1832, Percheron (Mag. Zool. Cl. ix., pl. 48) described and figured a species from an unknown locality, which he called *Cephalelus infumatus*.

In 1839, Burmeister (Handb. Ent., ii., p. 106) described an insect from the Cape under the name of *Dorydium paradoxum*, but at p. 1006 stated, that his insect was identical with Percheron's, and shortly afterwards figured it as such in his "Genera Insectorum." Instead of dropping the generic name, as he was bound to do, he used it again for an allied insect from Sicily, which he described and figured as *Dorydium lanceolatum*. This figure is referred to at p. 1006, and appears to have been published while Part II. of the "Handbuch" was passing through the press, and would, therefore, have priority over it.

Nor does the confusion end here. In 1837, Herrich-Schäffer described (Panzer, Heft 144, pl. 6) an insect from Nuremberg as *Jassus paradoxus*; oddly enough, another species with a long frontal prominence, though, judging from the figure, I should say that it is certainly not congeneric with either *Dorydium* I. (*Cephalelus*), or *Dorydium* II. Signoret (Ann. Soc. Ent. France (5), ix., pp. 259-265) confuses everything. Firstly, he gives the genus *Cephalelus* with four species: *infumatus*,

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Perch., and *percheroni*, Guér.,* from South Africa, and *C. marginatus* and *brunneus*, G. R. Waterhouse, from Australia. I may say that the two latter are closely allied to, if not actually congeneric with, *Dorydium* (?) *westwoodi*, and do not belong to the South African genus *Cephalelus*. Next to *Cephalelus*, Signoret places the genus *Dorydium*, with the two species, *D. lanceolatum* and *paradoxum*, Burm.; but for the latter he gives the locality Paris; and his insect is evidently *paradoxus*, Herrich-Schäffer; Burmeister's species being, as we have seen, *Cephalelus infumatus*, Perch., or a closely-allied species.

It is clear that *D. lanceolatum*, Burm., must be regarded as the type of *Dorydium*, and that most of the species referred to *Dorydium* will have to be removed either to *Cephalelus* or new genera formed for them, if necessary. But this task I will leave to the next specialist who takes up the *Jassidæ*.

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* I cannot find a reference to this species, and suspect it may be an error.

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XIV. *Some new species of Membracidæ.* By the Rev. Canon Fowler, M.A., F.L.S.

[Read 14th March, 1894.]

I have for some time past been engaged in working out the *Membracidæ* for the Biologia Centrali-Americana, and in the course of my work I have received a large number of specimens from the Vienna Museum through the kindness of Dr. Ganglbauer and Herr Handlirsch, and from the Belgian Museum through the kindness of M. Severin; I am also much indebted for help to Dr. Aurivillius of the Stockholm Museum, but as the specimens he has sent me are exclusively Central American there are none that I can here notice; among the others, however, there are several interesting species which lie outside the scope of the Biologia, and a few of these I have described below.

At present there is great confusion with regard to certain of the genera of this very extensive and interesting group of insects, partly owing to the fact that Walker's work, though embracing a large number of genera and species, was very slight, and in some cases most confusing, as he places the most dissimilar insects under one genus, and partly because Stål, if in doubt, appears to have disregarded Walker's work, and redescribed the species.

Tropidoscyta transiens, sp. n.

Parva, brevis, testacea, aureo-pubescens, capite magno, antice rotundato, pronoto inæquali, antice in cornu brevissimum rotundatum fuscum producto, carinis duabus supra humeros valde elevatis, humeris ipsis prominulis, dorso remotius punctato, carina centrali instructo, a latere viso pone medium fortiter sinuatim depresso, apice fusco perobtuso; tegminibus apicem prothoracis longe superantibus, hyalinis, venis testaceis, maculisque quibusdam obscure brunneis; corpore subtus fusco, postice testaceo; pedibus testaceis.

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A small short species, testaceous, with the metopidium, the very short bluntly rounded horn of pronotum, the apical portion of the two strong carinæ above shoulders, and the very blunt apex fuscous: the dorsum if viewed from the side is much depressed behind middle, and is extended into a short, blunt, very slightly deflexed apex; if viewed from the front the metopidium is large and broad, and appears to be furnished with five points formed by the anterior horn, the apex of the two suprahumeral carinæ and the slightly prominent shoulders; tegmina hyaline, with obscure dark markings, underside fuscous, hinderpart testaceous; legs testaceous. Long. cum tegm., 5 mm.; lat. int. hum., 3 mm.

Hab. Rio Janeiro. ♀. (Belgium Museum Collection.)

This species is closely allied to *Erecthia bicolor*, Walk., and also resembles *Tropidoscyta torva*, Stål (*Membracis torva*, Germ.); it is one of the species that complete the transition from *Membracis* to *Bolbonota*; no two genera can well be less alike than these, yet connecting forms occur which make it almost impossible to separate the intervening genera satisfactorily.

Bolbonota rufo-notata, sp. n.

Parva, nigra, pronoto carinato, a latere viso fere æquali, apice depresso, humeris, dorsoque plus minusve, rufo-ferrugineis; tegminibus pellucidis, basi nigrâ vel nigro-brunneâ, venis fuscis; pedibus rufis vel ferrugineis.

A small species, variable in colour, black with the shoulders and more or less of the disc of the pronotum of a ferruginous red colour, sometimes the black and sometimes the red colour prevailing; the pronotum is carinate and uneven if viewed from above, but if viewed from the side the central carina is almost level to apex, where it is depressed; punctuation coarse but obscure; tegmina transparent, hyaline, with the base black or brownish-black, sometimes ferruginous internally, veins dark and conspicuous; legs red or ferruginous. Long. 2 mm.; lat. int. hum., 1½ mm.

Hab. New Granada (Nolken), (Vienna Museum Collection); five examples.

The species is allied to *B. pusio*, Germ., but the latter species is considerably larger, longer in proportion, quite black, and more coarsely punctured, with the dorsum more level and the apex differently formed; it is also closely akin to *B. inæqualis*, Fab., but, apart from the colour, it is much more finely punctured than that species and has the dorsum more level if viewed from the side.

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Bolbonota auro-sericea, sp. n.

Opaca, dilute-testacea, pube aureo-sericeâ dense vestita ; capite pronotoque sat dense subtiliter punctatis, illo elongato sat angusto, hoc carinâ centrali integrâ, carinisque tribus utrinque supra humeros instructo, dorso a latere viso æquali, recto, mox ante apicem depresso, apice utrinque carinâ brevi obliquâ ; tegminibus flavis, ad medium dilutioribus, ad basim apicemque brunneo-variegatis ; corpore subtus pedibusque testaceis, pectore femoribusque ad partem infuscatis.

A rather large light testaceous species, thickly clothed with fine golden pubescence ; pronotum very finely punctured with the central keel and three abbreviated keels on each side above shoulders, and a small oblique keel on each side of apex, distinct, the rest of the surface even, dorsum almost straight, if viewed from the side, depressed just before apex ; tegmina yellow, dark before apex and near base ; underside and legs testaceous, chest and upper part of femora infuscate. Long. cum tegm., 5 mm. ; lat. int. hum., 3 mm.

Hab. North America. ♀. Coll. Signoret (Vienna Museum Collection).

As far as I know this is the only species of Bolbonota yet recorded from North America ; the genus is omitted in Dr. Goding's synopsis (Trans. Am. Ent. Soc., xix., 253) ; it is a very distinct species.

Triquetra obtusa, sp. n.

Testacea, unicolor, pronoto tectiformi, sat fortiter ad latera subrugosius punctato, dorso recto antice altissimo in cornu haud producto, sed obtuse angulato, metopidio longo, fere recto, cornubus humeralibus porrectis, acutis, apice longo, acuto usque ad apicem tegminum extenso ; tegminibus totis hyalinis, venis dilute testaceis ; pedibus testaceis.

A large species of a unicolorous testaceous colour, with the pronotum tectiform, rather strongly and at the sides subrugosely punctured, with the dorsum continued in a straight line from apex (which is long, sharp, and acute) to the metopidium, which is then abruptly declivous in almost a straight line ; at the place where the dorsum and metopidium meet there is no trace of a horn as in the allied species ; tegmina entirely hyaline, with the veins light testaceous ; legs testaceous. Long. 14—15 mm. ; lat. int. corn. hum., 10½ mm.

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Hab. New Granada (Nolken), (Vienna Museum Collection), three specimens; Ecuador (E. de Ville), (Belgium Museum Collection), four specimens.

This species may easily be distinguished from *T. grossa* (with which latter species *T. virgata* and *T. virescens* are synonymous) by the shape of the front part of the prothorax. I found the specimens above referred to among the unnamed material of the Stockholm and Vienna Museum Collections, and set on one side as a new species; it may possibly be referred to *Triquetra grossa* as a hornless variety, but I have examined a very large number of the last-named species, and have not found one specimen like *T. obtusa* among them.

Potnia jansoni, sp. n.

Testacea, capite sat magno, metopidio supra caput plicato, pronoto antice in cornu brevissum, obtusum, rufescens late nigro-marginatum extenso, fortiter punctato, carinâ centrali, costisque utrinque quattuor vel quinque sat regularibus instructo, humeris leviter prominulis, lateribus sensim in processum longum extensis; tegminibus prothoracem vix superantibus testaceo-hyalinis, apice ipso fumoso; corpore subtus pedibusque testaceis.

Somewhat elongate for a *Potnia*, testaceous, with the pronotum strongly punctured, produced in front into a very short blunt horn, which is reddish, with the margins broadly black, the black colour being extended for a short distance on the dorsum, central keel and four or five regular costæ on each side well marked, apical process long, very slightly deflexed; tegmina produced very slightly beyond prothorax, testaceous hyaline with the apical margin smoky; legs and underside testaceous. Long. cum tegm., 8 mm.; lat. int. hum., 3½ mm.

Hab. Demerara (Janson), ♂. (Belgium Museum Collection.)

Potnia perobtusa, sp. n.

Præcedenti affinis, sed minor, colore dilutius testaceo, pronoto antice minus porrecto et perobtuse angulato, processuque postico breviori et rectiori, apice magis obtuso, distinguendus.

Very like the preceding, but smaller and lighter coloured and less strongly punctured, with the pronotum very obtusely angled and not extended into a horn, and with the posterior process shorter and straighter; the tegmina are hyaline with the veins testaceous. Long. cum tegm, 7 mm.; lat. int. hum., 3 mm.

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Hab. Rio Janeiro and Botafogo, Brazil; a fair series. (Belgium Museum Collection.)

Both these species have the facies of *Enchotype*, rather than of *Potnia*, the pronotum being distinctly and regularly ribbed; but the presence of four apical areas on the wings prevent their being classed with the former genus as at present constituted.

Enchotype concinna, sp. n.

Parvula, castanea, pronoto fortiter rugose punctato, linea centrali aliisque utrinque irregularibus utrinque elevatis, humeris a fronte viso obtuse prominulis, cornu antico fere recto, brevi, lato, acuto, unicarinato, apice postico longo, acuto; tegminibus hyalinis venis testaceis, apicem versus fuscis; pedibus testaceis.

A small dark castaneous species, with the pronotum coarsely and rugosely punctured, with the central line and others on each side elevated, and with the shoulders, if viewed from the front, obtusely prominent; anterior horn situated just above metopidium, short, broad, and almost upright, and sharp at apex; tegmina vitreous, with the veins testaceous towards base, darker towards apex; legs testaceous. Long. cum tegm. 6 mm., lat. int. hum. 4 mm.

Hab. Cuba (Mayr., Vienna Museum Collection).

This species is closely allied to *Enchotype fairmairei*, Stål. (*Hoplophora fairmairei*, Guér.), but differs in the shape of the prothoracic horn, which is much shorter, less porrect, and more upright, and also in the smaller size, less strong pubescense and darker venation of the tegmina.

Enchotype is a sub-genus of Stål, which is closely allied to *Potnia*, from which it is chiefly separated by the fact that the wings have three instead of four apical areas; it is very distinct from *Hoplophora*, of which it is by some authors reckoned as a sub-genus. The species above described is plainly an *Enchotype*, but it has besides the three apical alar veins a very minute fourth one on the exterior margin, which appears to be a thickening of a vein and to be quite distinct from the exterior area of *Potnia*.

Hoplophora unicolor, sp. n.

Longa, lata, parallela, capite et pronoto toto rufo-ferrugineo unicolori, illo parvo, hoc fortiter punctato, humeris prominulis,

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dorso a latere viso fere recto, haud elevato, lineâ centrali et tribus vel quattuor aliis utrinque sat regularibus, elevatis, apice acuto; tegminibus elongatis, testaceo-hyalinis, immaculatis, venis totis testaceis; corpore subtus infuscato, pedibus rufo-testaceis.

A long, broad, parallel species, with the head and pronotum entirely rufo-ferruginous, unicolorous; head small, thorax very coarsely punctured, with a central raised line and three or four on each side which are almost regular and very little broken, apex sharply pointed; tegmina long, testaceo-hyaline, without any dark spots, and with all the veins testaceous; underside infuscate, legs rufo-testaceous. Length sine. tegm. 10 mm.; cum tegm. 15 mm.; lat. int. hum. 7 mm.

Hab. Colombia.

Two female specimens (Vienna Museum Collection). This species is related to *H. gigantea*, and is very closely allied to a new species which I have described from Mexico, under the name of *H. signoreti*.

Hille ecuadorensis, sp. n.

Elongata, brunnea, pronoto dense et fortiter subrugose punctato, carina centrali, lineisque quibusdam elevatis utrinque instructo, cornu dorsali lato obtuso tricarinato infuscato, in metopidium dorsumque sensim descendente; tegminibus brunneo-hyalinis, parte dimidiâ basali fortiter punctatâ, opacâ; corpore subtus nigro; femoribus infuscatis.

A small elongate castaneous-brown species, with the pronotum thickly and strongly and subrugosely punctured, with a central keel and four or five elevated lines on each side, and with an obtuse dorsal horn, which is tricarinate and infuscate and slopes gradually down to the metopidium and the dorsum; tegmina brownish hyaline, with the basal half strongly punctured; underside black. Long. 7 mm.; lat. int. hum. 3½ mm.

Hab. Ecuador (Coll. Signoret. Vienna Museum Collection).

Telamona prœalta, sp. n.

Fusco-brunnea vel fusca, carinâ centrali prothoracis nigrâ, capite pronoto multo angustiori, illo fortiter punctato, humeris prominentibus, subauriculatis, ad latera rugose carinato, protuberantiâ dorsali magnâ, prœaltâ, apice antice late rotundato, postice minus alto margine recto, angulo postico obtuso, ad basim utrinque fortiter impressâ; tegminibus externe hyalinis, ceteris, prœcipue ad apicem, fumosis; corpore subtus pedibusque fusco-brunneis.

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Dark fuscous brown, with the central carina of the pronotum and sometimes apical portion of the dorsal protuberance black; pronotum strongly punctured with a very large and elevated dorsal protuberance; this is strongly declivous behind and in front, and in front is broadly sinuate before metopidium; its apex is broad, rounded and elevated in front, less high and with a straight margin behind, and with the posterior angle obtusely rounded, but marked; tegmina hyaline externally, with the base and apex dark and the central portion smoky; underside and legs fuscous. Long. cum tegm., 9—10 mm.; lat., 5—6 mm.

Hab. Saguenay, Brazil (V. Huart); several specimens (Belgium Museum Collection).

Telamona ruficarinata, sp. n.

Sat angusta, capite nigro rufo-variegato, pronoto rugoso, fortiter punctato, brunneo-testaceo fusco-variegato, carinâ centrali rufâ a capite usque ad apicem extensâ, et carinis quibusdam inæqualibus et rugosis utrinque instructo, protuberantiâ dorsali paullo ante medium, magnâ, latâ, rotundatâ, cornubus anterioribus ad humeros latis, porrectis, subauritis, paullo reflexis, ad apicem rotundatis; tegminibus nigro testaceoque variegatis, venis rufescentibus, apicem versus dilutioribus; abdomine, basi segmentorum flavescenti excepta, nigro; pedibus testaceis, ad partem infuscatis.

Comparatively narrow, with the pronotum testaceous-brown variegated with black, and with a red carina running from just above head to apex; tegmina variegated with fuscous and testaceous and with the veins rufescent; abdomen black with the apex of the segments yellowish; chest black; legs testaceous, partly infuscate; prothorax rugose, strongly punctured, irregularly carinate on each side of the central line, with a large broad protuberance a little before middle, descending in front abruptly to the dorsum, and so leaving a flat and level space before metopidium; anterior horns porrect, broad, rounded at apex; apex of prothorax extending nearly to apex of tegmina. Long. cum tegm., 10 mm.; lat. int. hum, 5 mm.

Hab. Bogota (Coll. Signoret. Vienna Museum Collection); one male specimen.

Lucilla intermedia, sp. n.

Elongata, angusta, ab humeris pronoti leviter obtuse prominulis ad apicem sensim angustata, griseo-brunnea, capite sat magno, pronoto perobscure fusco-variegato, carinâ centrali, lineisque utrinque tribus vel quattuor, sat regularibus, instructo, dense et fortiter punctato, dorso a latere viso late et persensim ad medium

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elevato postice depresso; tegminibus hyalinis ad basim externe punctatis, opacis, pedibus testaceis.

An elongate narrow species, of a griseous brown colour, with a few obscure fuscous markings on pronotum, which is almost unicolorous; head rather large, ocelli distinctly nearer to one another than to eyes, central keel strong and distinct throughout from just above head to apex, which reaches beyond or at least as far as apex of tegmina and is very gradually and bluntly pointed; the lateral carinæ are fairly regular, three or four on each side; the dorsum if viewed from the side is very broadly and slightly elevated, depressed towards apex, and almost imperceptibly and broadly truncate to metopidium; tegmina hyaline, punctured towards base; legs testaceous. Long., 7 mm.; lat. int. hum., 3 mm.

Hab. Ecuador (Coll. Signoret. Vienna Museum Collection).

I have referred this species to Stål's genus *Lucilla*, as it is very closely allied to *Oxygonia viridula*, Fairm., which Stål mentions as his type of the genus. I am somewhat doubtful, however, as to the generic value of *Ennya* and *Lucilla*, and they cannot be separated from the *Hille* group on the character assigned by Stål (v., Ofv. af. Kongl., Vet. Ak. Förh., 1867, No. 7, p. 555), "corio areola discoidali destituto," as a discoidal area is certainly sometimes present. *L. intermedia* differs from *L. viridula* in its more elongate form and in the shape of the dorsum, which is much flatter and highest behind middle, whereas in the last-named species it is highest before middle; the sculpture is also different. The two types of *Oxygonia viridula* in Signoret's collection, from the Vienna Museum, are before me. I believe, however, that they belong to two different species.

Paradarnoides, n. g.

Oblongus, capite longitudine latiori, fronte angustâ, ocellis inter se quam ab oculis distincte magis remotis, oculis prominentibus; pronoto ad humeros leviter obtuse prominulos latissimo, deinde sinuatim angustato et in processum longum, ad basim latum, postice subparallelum, a latere viso leviter deflexum, acutum, utrinque ad latera ab humeris usque ad apicem profunde impressum, producto, dorso a latere viso ad basim processus leviter sinuato, carina centrali per totum percurrenti; tegminibus apicem prothoracis vix superantibus, areis apicalibus quinque, discoidalibus tribus; alis areis apicalibus quattuor.

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Oblong, subparallel, with the ocelli evidently further removed from one another than from eyes, which are prominent; pronotum with the shoulders, which are set far back, obtusely prominent, behind these gradually narrow, with a gentle sinuation and continued into a long process, which is strongly and broadly impressed at margins from shoulders to apex, and if viewed from the side is gradually deflexed and evidently carinate, the carina being continued to the frontal margin of the metopidium; tegmina slightly exceeding the apex of prothoracic process, with five apical and three discoidal areas, the areas being for the most part subequal and oblong; wings with four apical areas; legs rather slender.

This genus appears to be allied to *Darnoides* as represented by its type *Darnoides limbata*, but may be easily known by the position of the ocelli, the more prominent eyes, and the fact that the tegmina have three discoidal areas; the form, moreover, is more subparallel and less narrowed behind, and the shape and sculpture of the prothorax behind shoulders is very different.

Paradarnoides severini, sp. n.

Major, capite fusco, rugoso, pubescenti, metopidio rugosê punctato, fusco-testaceo, maculis duabus fuscis antice convergentibus, interdum fere deficientibus, pronoto pone humeros fortius punctato vittâ latâ fuscâ, deinde dilute testaceo, apice longo fusco; tegminibus fusco-hyalinis, ad basim punctatis, venis testaceis; corpore subtus fusco pubescenti; pedibus testaceis plus minusve infuscatis.

Head rugose, pubescent, fuscous, pronotum testaceous in front, then broadly fuscous behind shoulders, and then light testaceous, the apex being fuscous or reddish fuscous; on the metopidium there is a broad fuscous patch on each side of the central carina (which is testaceous); these however are sometimes confused or almost wanting; punctuation of prothorax rugose, strongest behind shoulders; tegmina fusco-hyaline, with the base more or less broadly fuscous and punctured, veins testaceous, underside fuscous, strongly pubescent in front; legs testaceous with the femora and tibiæ more or less infuscate. Long. cum tegm., 9 mm.; lat. int. hum., 3½ mm.

Hab. Guadaloupe (Delauney), (Belgian Museum Collection); three female specimens.

There is a larva of this species in the Belgian Museum Collection; it is onisciform, broad and subparallel, but rather wider behind, with the front parts uneven, and the

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abdominal segments furnished at the sides with broad oblong processes, fringed with setæ; the colour is dirty testaceous, but has probably considerably faded.

Paradarnoides ignipes, sp. n.

Præcedenti affinis, sed minor, colore nigro, metopidio longiori, processu pronoti ad medium albido-marginato, prothorace distinctius et minus rugose punctato, pedibusque miniatis facile distinguendus.

Allied to the preceding, but smaller, with the shoulders set very far back so that the metopidium is only slightly declivous; of a black colour, with the margins of the pronotum narrowly edged with white behind shoulders, and the apex ferruginous; the eyes are very prominent, and the front part of the head is clothed with golden pubescence; the pronotum is more closely and less rugosely punctured than in the preceding species; the tegmina have the base of the claws and the external margin of carina towards base black, and the veins large and fuscous; the underside is black with the front parts strongly pubescent, and the legs are bright scarlet, with the exception of the coxæ and tarsal claws, which are fuscous. Long. cum tegm., 7½ mm.; lat. int. hum., 3 mm.

Hab. Guadeloupe (Delauney), (Belgian Museum Collection); one male specimen.

It is just possible that this may be the male of the preceding, but I do not think that this can be the case, as the insect differs considerably in the structure of the front part of the pronotum, which in *P. ignipes* is much longer from the shoulders to the eyes than in *P. severini*; in general appearance they are quite distinct.

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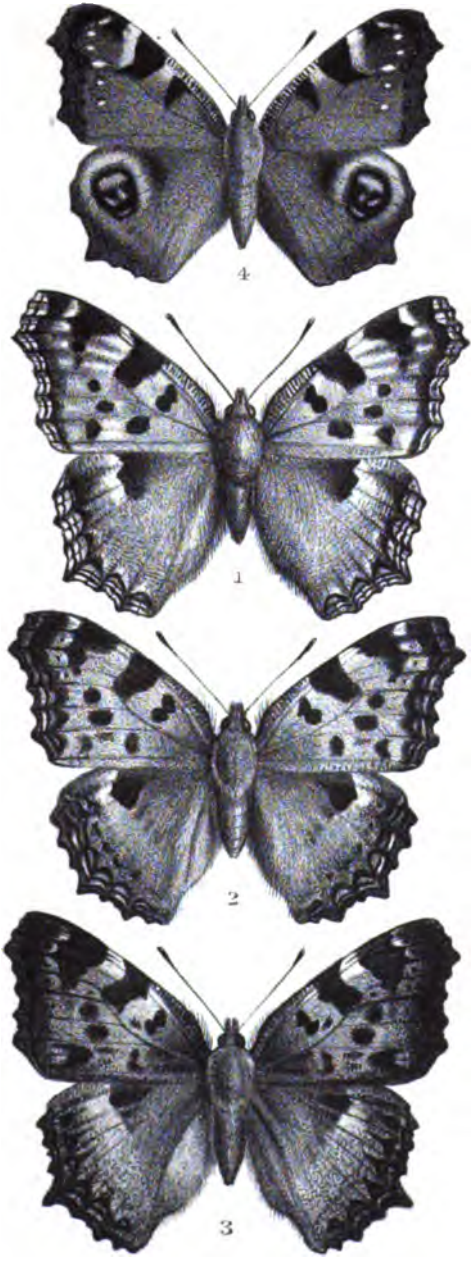

F.W. Frohawk ad. nat. lith. West, Newman, imp.

Effects of temperature on certain species of Vanessa.

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XV. *Temperature Experiments in* 1893 *on several species of* Vanessa *and other Lepidoptera.* By Frederic Merrifield, F.E.S.

[Read March 14th, 1894.]

Plate IX.

In my last paper (Trans. Ent. Soc. Lond. 1893, p. 57) I described some experiments on pupæ of *P. napi*, offspring of the spring emergence, and mentioned that I had some pupæ offspring of the summer emergence. The parents consisted of two males and two females, taken at Hailsham, and kindly sent to me by Mr. Vine on the 30th July, and two females taken at Petworth on the 5th August, and kindly given to me by Mr. Fletcher. From these I had several hundred eggs, which were laid much more freely on *cardamines* than on cabbage, though the larvæ seemed to feed as willingly on the latter as on the former.

Early in September nearly all pupated. Ten were placed at 90° for ten days, a period amply sufficient to have caused their emergence had they belonged to the earlier brood, but it produced no effect either on the date of their emergence, when afterwards placed out of doors, or on their markings or colouring. The rest were kept out of doors. Some were forced about the middle of February, and some more early in March, emerging in from eight to seventeen days. The difference in appearance between these and the rest, which emerged out of doors between the 20th April and 9th May (except one which emerged 6th June), is the same in kind (though somewhat less in degree) as the difference between those of the summer emergence, which were forced all through, and those of that emergence which were cooled for the greater portion of their pupal period, as described Trans. Ent. Soc. Lond. 1893, p. 57.

Consequently I may apply to the winter pupating brood the general remark made there, as to the brood which pupates in the summer, viz., that a part but not all of the characteristic seasonal colouring of this species depends on the temperature to which the individual is

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subjected, adding that the spring emergence appears to be less sensitive than the summer emergence is to temperature. Neither of the broods experimented on by me has proved so sensitive as those operated on by Prof. Weismann, and described by him ("Studies in Heredity").

Pararge egeria. This insect has two well-known climatic forms, the light spots in the South European form having the bright ochreous colouring of *P. megæra*, instead of the straw colour of the English var. (*egerioides*). But the experiments tried afford little or no reason for supposing that these differences in appearance are the direct result of temperature.

I obtained, between the 25th May and the middle of June, more than one hundred pupæ, which were subjected to various temperatures from between 80° and 90° down to 33° (for many weeks), with various transfers from the lower to the higher temperatures.

The chief difference, in general appearance, is between Classes I. and II. (forced) on the one hand, and Classes IV.–XIV. (those at 56° and under). The former have the light spots smaller and less clearly defined, and the dark ground colour considerably lighter, and in many cases freckled with small dark brown spots. Class III. (open air, at about 66°) are not quite so dark as Class IV., but much nearer to them than to the forced.

Though the light spots in those forced are smaller than in the others, they are somewhat more numerous. Class VIII. (iced and then forced) have the ground colour dark, but the light spots as numerous as in those which were forced, and as large as are the spots in those at the lower temperatures. One of these indeed, which I exhibit, has an inner row of light spots or traces of them on the secondary wings in nearly all the interspaces, and on the underside a perfect submarginal chain of six light spots, pupilled with dark brown, on a light ground colour.

A few examples I reared from eggs laid in August showed the same effects generally as those from the eggs laid in April and May, so that there does not appear to be any marked constitutional difference in this respect between the spring and summer emergences of this species; my experiments would, however, lead me to expect those which emerge in spring to be in general

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more vivid in their markings and colouring than those which emerge later, after a spell of hot weather.

Cidaria silaceata. This is known to be very variable in its markings, and I was tempted to experiment on it by the remark of M. Guenée that the spring and summer broods appear to vary as in the *Selenias*, and by other observations (Ent. Record, ii., 297), to the effect that the summer brood is smaller, and the band across the forewings less broken.

Mr. Nicholson kindly gave me some eggs early in April, from which I had pupæ, which were subjected to about the same variety of temperatures as were the pupæ of *P. egeria*, above mentioned.

The main difference is between those at or over 80° and the rest; the latter being more strongly marked than the former, the transverse band perhaps showing a slightly greater tendency to be broken, and their light markings being of a rather more ochreous tint; as a consequence, those at 80° or over have a duller and more uniform appearance than the others.

But the most distinctive feature is in the size. Those at or over 80° are, as a class, smaller than the others. This species, therefore, must be added to those in which temperature, during the pupal period, affects the size of the imago. The difference in colouring and marking is hardly as great as I should have expected, and seems scarcely so great as that sometimes met with between the spring and summer natural emergences, though it is in the same direction. I intended to experiment on the winter pupating brood, but a brood which I had from the second emergence came out as a third emergence, and were nearly all spoiled before I discovered that they had emerged.

Araschnia levana. Desiring to experiment with pupæ of the summer emergence (var. *prorsa*) for their whole pupal period, I obtained, through Mr. Edwards, from North Germany, a large number of pupæ from which I had, towards the end of April, thirteen good pairs, which I placed over growing nettle, in headless casks, and fed on orange, etc. All circumstances, including abundant sunshine, appeared most favourable; but I only obtained thirty-two eggs, laid (I believe by a single parent) mostly in strings of from two to eight, projecting from the undersides of the leaves. Only eleven

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hatched, beginning 15th May, and all of them pupated. Three were forced at 80°, producing in from six to seven days the characteristic black *prorsa* form; four others were, at from one to eight hours' old, placed in the refrigerator on the 18th June, and remained there, at about 48°, till 30th or 31st August (seventy-three or seventy-four days), when, observing signs of emergence, I placed them in the room at about 65° to 70°, and there three of the four emerged in a day or two, the fourth not until thirty-two days more, *i.e.*, on the 2nd October.

The remaining four were placed at 33° till 29th September (eighty-four days), then moved to the refrigerator at about 48°, whence, after twenty days more, they were moved to the room, about 59°, three of them emerging respectively in ten, eighteen, and twenty days more (total 114–124 days). The first of them was a cripple, and the fourth died. This left six of the eight subjected to a low temperature. These six all emerged in perfect condition, and were unmistakably of the true *levana* type; two of those cooled, without having been iced, showing slight traces of the intermediate *porima* form, but the other four being of the pure *levana* type, and nearly as different in colouring from the three that were forced as one of the common fritillaries—say *A. selene*—is from a "white admiral" (*L. sibilla*). I exhibit examples of the two forms.

I now proceed to describe some experiments on four species of the genus *Vanessa*. In reference to these I have had the great advantage of submitting the specimens experimented on in the manner described in this paper, to the careful examination of Dr. Dixey, whose paper on the phylogenetic significance of the wing-markings in certain genera of the *Nymphalidæ* will be found in Trans. Ent. Soc. Lond. 1890, p. 89, and he has favoured me with valuable observations upon them, which I am permitted to append; they are distinguished by being placed within brackets. The "series" and "spots" referred to in these observations are described in Dr. Dixey's paper, and may be indicated generally as follows, *V. urticæ* and *V. polychloros* being convenient examples for the purpose:—Four dark patches on the costa, continued in series more or less perfectly across the wings, distinguished by the Roman numerals I., II., III., IV., the latter including the dark submarginal band.

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Four lighter areas, A, B, C, D, alternating with the dark ones, A being the innermost, and coming before I.; these also continued in series more or less across the wings.

Vanessa polychloros. There were sent me on the 6th May, a brood of between 130 and 140 larvæ found on sallow in the New Forest; they were about three-eighths of an inch in length. I found they would eat cherry and birch, but seemed to prefer willow, on which accordingly I placed them, at first in two, and afterwards in four, large sleeves. On the 27th May, one had begun to spin, and all were brought indoors and fed on cut willow. There were 138; by the 31st 127 had spun up, and the rest followed in a few days. Their pupæ were subjected to temperatures ranging from 100° to 32°, being in many cases transferred, after a time of varying length, from the lower to the higher temperature, or *vice versa*. I proceed to give their treatment in detail:—

Class I., forced at from 90° to 100° (Plate IX., fig. 1). Most of these died, but a few at 90°, or a few degrees lower, did well; forced as pupating larvæ or pupæ under twelve hours, they emerged in seven days. A second lot of ten (Class II.) were put in a shady place out of doors, where the temperature averaged about 62°, and all emerged in from twenty to twenty-two days. A third lot (Class III.) were placed in a cellar at a temperature averaging about 56°, where all emerged on the fortieth day. A fourth lot (Class IV.) were placed in the refrigerator at about 48°, and, after periods ranging from fourteen to forty-six days, transferred to (*a*) the forcing box at 80°–90°, emerging in from three to five days more; (*b*) the cellar at 58°, emerging in from twelve to twenty-five days more; or (*c*) the room, at 68°–75°, where they emerged in from four to five days more. A fifth lot (Class V.) were iced for periods ranging from fourteen to forty-two days, and then (*a*) placed at 80°–90°, emerging in five to seven days more; (*b*) in the cellar at about 59°, emerging in twenty-seven to thirty days more; or (*c*) the refrigerator at about 49°, for from six to thirty-two days, and then, either the cellar at 58°, emerging in from twenty-two to twenty-three days more, or the room at about 68°–75°, emerging in two to twenty-eight days more. With the exception of a few that were injured by accidents, of those that were killed by excessive heat, as mentioned before, and of four or five among those longest iced, all emerged, and except among some of those iced, there were no cripples.

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The effect on colouring was as follows :—

Class I. (forced at about 90°, or upwards), emerging in seven days). The ground colour of a lighter and yellower hue of brown than is normal, with many yellowish clouds and broad streaks, especially in the interspaces of the nervures on the outer half of the forewings. [Black spots generally are more sharply defined than in normal specimens. There are no blue submarginal crescents in the forewings, but many bluish scales on the extreme margin. The spots in "Series D" are particularly well-defined near the costa, and are not pupilled.]

Class II. (shade, out of doors, at 51°–69°, averaging about 62°, emerging in twenty to twenty-two days). Ground colour of a redder brown, and with few yellowish clouds; the yellow submarginal outer line is especially reduced, and the dark band inside it widened and darkened.

Class III. (cellar at 54°, rising to 58°, averaging 56°, emerging in forty days). Effects intensified; the yellow submarginal line has almost disappeared, and there is a scattering of dark spots on the ground colour, in some cases forming a streak in front of the inner edge of the forewings. [There are indications of blue submarginal crescents in the forewings, but less blue in the fringe or extreme margin than in I. The spots in "Series D" sometimes bear minute black pupils.]

Class IV.*a* (refrigerator, about 49°, fourteen to forty-six days; then forced at 80°–90°, emerging in five days). Effect rather a mixture of those in Classes I. and III.; the scattering of dark spots exists, but the yellowish clouds and yellow submarginal streaks are partially restored; in those exposed to the low temperature for forty-two days, there were several that died or were crippled, and the dark markings in some others are varied with a paler hue, giving rather a "greasy" appearance to these dark parts. [The spots of "Series D" often with minute black pupils; "Series C" is indicated in the hindwings by a row of black points; a new dark spot tends to be formed between "II.8" and "III.8."]

Class IV.*b* (refrigerator at about 49°, fourteen to forty-six days; then cellar at 56°–60°, emerging in twenty-five to twelve days, or room 65°–75°, in five to four days). Much like Class III., except that the ground colour is duller, and the submarginal blue tends to be supplanted by black; in those longest exposed to cold, the dark parts tend to spread. [Tendency to formation of new dark spots continues.]

Class V.*a* (iced at 33°, fourteen to thirty-eight days, then forced at 80°–90°, emerging in seven to five days). These, unless iced

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twenty-nine days or more, are very like IV.*a* ; iced for that or a longer period, they are darker ; in all cases they show a return of the yellowish markings.

Class V.*b* (iced at 33°, fourteen to forty-two days, then at various temperatures, such as cellar at 59°, emerging in twenty-seven to thirty days ; or refrigerator at about 49°, six to thirty-two days, and then in cellar or room, emerging in twenty-one to two days more). These are classed together, because the effects seem to depend on the duration of the icing. No great effect is produced under twenty-nine days' icing ; the extreme darkness, often without crippling, is produced by icing thirty-six days, followed by the refrigerator at 49°, for six to nine days (Plate IX., fig. 3); but some taken straight from the ice to the cellar are nearly as dark. Of those iced from thirty-eight to forty-two days nearly all died, or were more or less crippled ; one of the latter has nearly all the four spots on the forewings obliterated ; and it may be observed that the icing for thirty-six days or more, followed by the refrigerator, which produces the extreme dark effect, has a tendency to cause the normal spot near the inner edge, which is nearest the base of the forewing, to disappear.

As regards the general appearance of those which show the extreme effect of the low temperature, it may be said that they much resemble *V. xanthomelas*. [Tendency to formation of new dark spots continues. An additional dark spot may also appear in cell (forewing) below "I" and "II." The border may become uniformly dark.]

A second company of *V. polychloros*, just changing their last skin, reached me on the 2nd June, also on sallow. Sleeved on cherry they did very well. Some were forced, emerging in six and a half to seven days. Others, placed out of doors at a temperature ranging from 67° to 59°, averaging about 64°, emerged in sixteen to seventeen days. This was a rather lighter coloured company of butterflies. There is the same kind of difference in appearance between the forced and the others, as there is between Classes I. and II. of the first company, but it is less in quantity.

V. polychloros, general conclusions. The colouring is considerably affected by temperature in the pupal stage, low temperatures producing a deepening of the ground colour and an extension of the dark markings; and high temperatures producing a lightening of the ground colour and an extension of the yellowish markings. The blue and bluish markings are strongest in those at moderately

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low temperatures, Classes III. and IV., in many of which they form some rather bright crescents on the forewings; but at the extremely low temperatures they tend to be supplanted, in some cases entirely so, by black.

[Forcing invariably tends to produce yellow, whether pupa previously warmed or cooled. Refrigeration produces increased breadth of dark brown, whether followed or not by forcing.] I may add that among the specimens I exhibit, one belonging to Class IV.*a* (refrigerator thirty-eight days, then cellar four days, and forced three days) (Plate IX., fig. 2), to which my attention has been directed by Dr. Dixey's observations, is particularly interesting, showing "Series D" as a nearly complete chain of faint yellowish spots, or rather clouds, on both forewings and hindwings, the anterior three or four on the forewings, and all those on the hindwings having each a small black point in the centre. It seems as if it required cold, succeeded by heat, to cause this chain of *yellowish spots centred with black* to be brought out.

Nothing has been said about the colouring of the under sides. This varies moderately in darkness or lightness, but I have not been able to associate this variation definitely with temperature.

Vanessa atalanta. In looking carefully, and aided by a strong light, at the *V. atalanta* upon which experiments were made in 1892, as recorded, Trans. Ent. Soc. Lond. 1893, pp. 58–62, I noticed a feature which had escaped me before, viz., that eight out of the ten which were subjected to the high temperature of 80°–90° had a few dull orange scales on the upper side of the forewings, between the large white costal blotch and the row of smaller white spots nearer the hind margin.

I determined to develop this tendency by exposing some pupæ to a greater heat. The effect was a great development of this orange colour, both in intensity, it becoming distinctly scarlet, and in quantity, so as to form a scarlet cloudy patch sufficient to attract attention on casual observation. I exhibit several examples. This patch is between the large white costal patch and the third of the row of white spots beyond, and tends to form a scattered ring around this third spot; other scales, from golden brown to scarlet, are developed along the outer part of the costa and near the base, and elsewhere on the forewing.

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The following is a description of the treatment to which the pupæ were subjected, and of its results :—

A considerable number of pupæ were placed at a temperature of about 100°, at which nearly all died, after progressing so far as to show their imaginal colouring. I then lowered the temperature to about 90°–95°, with the result that the great majority of them show these markings, the scales being scarlet instead of dull orange, and in several cases being so increased in quantity as to form a scarlet clouding sufficient to attract attention when the insect is held at arm's length and more. These scarlet scales follow the nervure which separates the second from the third of the row of white spots above referred to; they are not on the nervure, but on each side of it, and in some cases extend to the nervure next below, and have a tendency to form a scattered ring round the third of the white spots. These scarlet scales are also to be found on the costa, extending in some cases from the beginning of the large white costal patch almost to the apex of the wing (an ochreous colouring in this region is to be observed in captured specimens). Associated with these markings is an increase of the brightness and warmth of the golden-brown colouring of the costa and nervures in the basal part of the wing; in some crippled specimens this golden-brown is very vivid, and makes some approach in hue towards the scarlet band across the wing; in some of these also a patch of the scarlet scales is to be found between the middle of the scarlet band and the large white costal spot.

In my paper on the experiments of 1892, I mentioned that on the underside of two out of ten specimens at from 80° to 90°, a new small scarlet spot appeared between the scarlet band across the forewings and the inner edge. In only six individuals out of those subjected to a high temperature in 1893 do I find scarlet in this region. I find it occurs in two places, both below the median nervure, viz., (*a*) just before it forks, (*b*) a little below the lower branch of the same nervure. One specimen (No. 4) shows both (*a*) and (*b*); three (Nos. 21, 39, and 49) show (*a*) only, and two of them but slightly; and two (Nos. 48 and 188) show (*b*) only.

The scarlet scales on the upper side are found in the great majority of those (about thirty) that were subjected to a temperature of 90°, or upwards, during their whole pupal period, and in three out of thirty-three that were subjected to 80°–100° during the earlier part of their pupal period; they are not found in any of the forty or so that were subjected to lower temperatures. The

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scarlet patches on the under side are only found in six out of forty-eight which were subjected to 99° or upwards, and five out of the six were so exposed for practically their whole pupal period.

In the opposite direction of low temperature, I tried further experiments with *V. atalanta*, the most marked results of which I exhibited at the meeting of the Entomological Society on the 8th November, 1893. They confirm, and in some cases carry further, the results obtained in the previous year. The low temperature causes much substitution of white, lavender, or metallic blue-green scales (one of these colours seeming readily in this insect to pass into another of them) for the black in normal specimens; the large white spot on the costa is greatly enlarged and spread, and the tendency of the third of the row of submarginal spots to ocellation which is above referred to, as caused by a high temperature, is shown in a different manner by the low temperature, which tends to form a whitish ring round, and very near to it (this third spot is on the underside ocellated in normal specimens).

The extreme low temperature forms are, on the whole, so decidedly smaller than the average, that I am inclined to think the low temperature is a cause of reduced size in this species, more especially as those at the high temperatures, even where this is so extreme as to kill some of them, are all of full size.

[*Forced.*—Resolution of inner margin of red band fairly marked.

Refrigerated.—Marginal blue much extended, especially about anal angle of hindwing and in centres of spots of "Series IV."; spots of "Series D" often ringed with pale blue, apart from ocellation; indications present of bluish centres to "Series III." in hindwings; greater general blackness.]

Mr. J. J. Walker has kindly given me a specimen from Gibraltar which resembles, in its main features, some of my earliest individuals. It was taken, recently emerged, on the 17th February, and I find that the mean temperature of January and February at Gibraltar may be as low as 48·7° and 50·9°. Dr. Chapman has kindly sent

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me some *atalanta* of a very late brood reared last October and November at Hereford, which also present some of the characteristic appearances of my cooled specimens.

Vanessa (*Grapta*) *c-album.* Owing to the kindness of Mrs. Hutchinson, who sent me some eggs laid by hibernated butterflies in the spring, and of Mr. Nesbitt, of Llandogo, who sent me larvæ of the second brood at the end of July, I have been able to ascertain that while both broods are affected by temperature in the pupal stage, the first brood is much the more sensitive of the two. It is remarkable that there should be so great a difference in constitution between these two broods, as, under natural conditions, the pupæ of both broods are exposed to temperatures differing by a very few degrees, the one passing the pupal stage in England about June, and the other about August. It is entirely consistent, however, with Mr. W. H. Edwards' experiments and observations on the two closely-allied American species, *Grapta interrogationis* and *Grapta comma*, as described in the "Canadian Naturalist" for 1877 and 1878, and much light is thrown on the subject by Prof. Weismann's observations on Mr. Edwards' experiments, in the Professor's "Studies in Heredity," by Prof. Meldola, vol. i., p. 149. The individuals experimented on, eight of the first brood and eleven of the second brood, were not sufficiently numerous to justify me in describing the results in detail; but I hope to try experiments on a much larger scale during the present year.

Vanessa io. Mr. Morris, of Lewes, kindly gave me a company of about one hundred and twenty larvæ, all in their last skins, or nearly so, on the 15th June, which in the extraordinarily early season of 1893 was late for them. I was much occupied in other ways, and perhaps it was owing to insufficient attention that I did not obtain more than about sixty pupæ, and those were a little under the full size. They were subjected to various temperatures from about 100° downwards. Those at 100° all failed to emerge. Sixteen, which were at 90° for six days, and then at 80°, all emerged in one day more, making seven days. As the temperature was lowered, there appeared a gradual tendency to disintegration of the ocellus on the forewing, until in one

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(Plate IX., fig. 4), iced at 33° for twenty-two days, then in the refrigerator for twenty days, and then in the cellar for eighteen days, it ceases to be an ocellus, being resolved into a chain of small white spots, which are bright, with only a very slight bluish shade about them, and affording a remarkable confirmation of Dr. Dixey's views of the origin of that ocellus, as exemplified in the plate attached to his paper in the Transactions for 1890. In these iced and cooled specimens the blue becomes more vivid, and a narrow dusky marginal band, slightly darker in hue than the chestnut brown ground colour, appears, with a submarginal incomplete row of small dusky spots, very distinct. On the hindwing there is little change, but a tendency to disintegration of the blue in the ocellus.

Dr. Chapman kindly sent me, on the 30th August, part of a second brood he had found rather more than half grown. From about forty larvæ I obtained thirty-eight fine and healthy pupæ, but nearly all were killed by the severe cold to which I subjected them, though only a little in excess of that to which No. 61 was exposed.

[I. *Forced*: a tendency shown to the development of dark spots at the apices of the interspaces ("Series II."); tendency towards fusion of bluish constituents of ocellus in hindwing. II. *Cooled*: tendency of "IV." (marginal chain) to separate from "D" (light apical spots); "IV." rendered more distinct in forewing. III. *Iced*: separation of "D" and "IV." as in II. "Claw-mark" tends to lose regular curve, and to become angulated. Bluish constituents of ocellus in hindwing tend to become separated into two parallel series—"III." and "IV.," *i.e.*, a marginal and submarginal.]

V. antiopa. About seventy pupæ, mostly rather fresh, were obtained for me from near Berlin by Mr. Edwards, on the 19th July, and were subjected to various temperatures from about 100°, emerging in from three to five days, and 80°, when they took a day or two more, downwards. The most severe temperature survived, without injury, was twenty-seven days in the refrigerator, at about 47°. All that were placed in ice (33°) for twenty days or upwards died, except one that was a cripple. The results are negative, as none show any marked differences in marking or colouring that can be assigned to temperature. The absence of positive

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results is very probably owing to the circumstance that the pupæ were all of them several days old when they reached me.

The experiments now recorded confirm in general the conclusions drawn from such as have preceded them, and some of which may be briefly enumerated as follows:—(1) The effects of temperature are different when applied at different periods of the pupal stage. (2) A great range of temperature may cause but little difference in appearance, while a very few degrees near the top or bottom of the range the insect will bear may cause a great difference. (3) There may be a great constitutional difference in sensitiveness to temperature between two seasonal emergences of the same species. (4) This may be so even when both pass the pupal period at about the same temperature (this is in accordance with Mr. W. H. Edwards' observations above referred to). (5) While some kinds of effect seem to be what may be called the direct result of temperature, in others, and perhaps the most important, temperature appears to operate by causing the individual to "throw back" to some ancestral form; this last circumstance has been considered to explain the reason why a low temperature in some species causes darkening of the colours, and in other species produces the opposite effect. (6) In these cases of "reversion," the kind of effect produced appears to depend on the stimulus applied, low temperatures producing one class of effects and high temperatures a different class of effects.

The whole subject is one of much complication, and calls for further experiments in many directions. The direction which mine have taken, following in the lines initiated by Weismann and W. H. Edwards, especially if pursued with species belonging to regions where the seasonal or other occasional differences of temperature are extreme—North America, Siberia, Japan, or the vicinity of mountains—will help to trace, and separate from the rest, such of the causes of variation as depend, directly or indirectly, on temperature. Systematic experiments on a number of well-selected species belonging to countries where the seasonal difference is hygrometric rather than thermometric, would probably produce valuable results. The nature of the food-plant,

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which undoubtedly influences size and vigour, and is generally considered also to influence markings and colour, offers another line in which experiments of a more systematic and comprehensive character than any yet tried would undoubtedly well repay the labour attendant upon them. There are other natural surroundings, most potent for many purposes, the effect of which might usefully be tested by experiment, such as light and electricity and magnetism. As to light, I tried, in 1891, some experiments on *B. cynthia* and *S. illustraria*, recorded in the Trans. Ent. Soc. for 1892, p. 42; but, so far, with negative results. And in 1891 I tried some experiments with strong magnetic currents on some Lepidoptera in all their stages; but these yielded no positive result.

NOTE.—As this paper and Dr. Dixey's, which succeeds it, contain observations on some of the same facts by two different and independent observers, there is necessarily some repetition, but in order to reduce this as much as possible, I have greatly condensed my own observations.

EXPLANATION OF PLATE IX.

FIG. 1. *Vanessa polychloros*: pupa at 90°–95°, emerging in seven days.

FIG. 2. *V. polychloros*: pupa about 49°, for thirty-eight days, then about 58° for four days, then about 85°, emerging in three days more.

FIG. 3. *V. polychloros*: pupa at 33° for thirty-six days, then about 49° for nine days, then about 58°, emerging in thirteen days more.

FIG. 4. *V. io*: pupa at 33° for twenty-two days, then about 49° for twenty days, then about 60°, emerging in eighteen days more.

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XVI. *Mr. Merrifield's Experiments in Temperature-Variation as bearing on Theories of Heredity.* By Frederick A. Dixey, M.A., M.D., F.E.S., Fellow of Wadham College, Oxford.

[Read March 14th, 1894.]

The results of Mr. Merrifield's experiments on the variations produced in butterflies by the exposure of the pupa to different conditions of temperature, are in themselves of great interest. But the interest becomes enhanced when it is recognized that many of the new features which make their appearance under these conditions are identical with those occurring normally in other species more or less closely allied to the subjects of experiment; that in not a few instances the disturbance of natural temperature-conditions appears to have caused reversion to an earlier stage in the phylogenetic history of the species; and further, that the ancestral features thus revived seem to vary with the nature of the disturbance.

Examples of these phenomena, from a previous series of experiments, were given in Trans. Ent. Soc. Lond. 1893, p. 55, and were commented on by me (*Ibid.* p. 69). The latest results obtained by Mr. Merrifield, besides confirming many of the former, furnish further instances of the same nature, as follows:—

I. Vanessa atalanta.

A. *Warmed.*

(1) The occurrence of red scales in the dark ground-colour between the middle of the scarlet band and the large white costal spot c. This is an approach to the condition in *V. huntera* and *V. myrinna*, and more remotely to that in *Grapta* and *Argynnis*. A corresponding feature is seen in *V. io*, which in this respect is more ancestral than *V. atalanta*.

(2) The tendency towards the formation of a scattered ring of red scales round the spots β and γ of Series D.

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This again recalls a common condition in *V. myrinna* and *V. huntera*.

(3) The appearance of a new red spot on the underside of the forewing, just below the stem of the median nervure before bifurcation. This represents a pale patch of various shades in *V. callirrhoe*, *V. myrinna*, *V. huntera*, *V. cardui*, etc.

(4) The appearance of another red spot on the underside of the forewing, just below the first median nervule. This represents a patch visible on both surfaces of *V. callirrhoe*, and fully developed in all the species nearly allied to *V. cardui*.

(5) The tendency towards resolution of the inner margin of the red band, as in *V. callirrhoe*.

(6) The suffusion of the dark ground colour with golden brown, also as in *V. callirrhoe*.

Of these, Nos. (1) (2) and (3) are points now observed for the first time; while (4) (5) and (6) are confirmations of previous results. (See a former paper by the author in Trans. Ent. Soc. Lond. 1893, p. 70.)

B. *Cooled.*

(1) Much substitution of lavender or metallic blue-green scales for black. This points to the ancestral condition seen in the females and parts of the males in many species of *Argynnis*, *e.g.*, *A. paphia*, var. *valesina*, *A. sagana* ♀, *A. niphe* ♂ and ♀, and *A. diana* ♀.

(2) The presence of minute patches of bluish scales near the margin of the dark ground-colour in the hindwing, indicating the blue centres of the almost completely merged Series III.—an ancient feature of *Vanessa* and *Grapta*.

(3) The marked increase of marginal blue, especially about the anal angle of the hindwing. This appears to represent the condition seen in *Argynnis niphe*, and ultimately to point back to the primitive Argynnid colouring of *A. valesina* and *A. diana* ♀.

These are all confirmations of former results.

II. Vanessa io.

In this species, warming tends to revive, in the forewing, a series of dark spots (II), occurring normally in

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Araschnia levana. Cooling tends in the first place to separate certain constituents of the ocellus, and when carried to a high extent has the remarkable effect of causing an unmistakable resolution of the ocellus in the forewing, the appearance finally produced being that of the ordinary *Vanessa* character in a comparatively unmodified form. It is interesting to see how completely these cooled specimens bear out the views which I ventured to express, some years ago, on the origin and constitution of this ocellus (Trans. Ent. Soc. Lond., 1890, pp. 99, 100, pl. i., fig. 12). The ocellus of the hindwing is also affected in the same direction.

III. Vanessa polychloros.

Cooling tends to produce several features which appear to be ancestral. The chief of these are (1) the pupilling with black of the spots of Series D in the forewing; (2) the occasional indication of Series III. in the hindwing; and (3) the tendency towards the formation of a new dark spot between II. 8 and III. 8. These points approximate towards the condition in *Grapta*.

IV. Grapta c-album.

In both broods cooling tends to induce or increase a darkness of ground-colour; this being undoubtedly an ancestral character.*

In all cases of this kind the obvious question occurs—are we to consider these phenomena as true instances of reversion, or is it merely that like causes have produced *de novo* a like effect in descendant and ancestor? The latter explanation may account for some of the facts, but, I think, not for all. It may perhaps give the reason for a general diffusion of bluish scales, or for a change of the ground-colour from black to brown, but it is scarcely adequate to explain the special formation of a definite pattern, as of Series III. with its blue centres in *V. atalanta*, or the reduction of the ocellus in *V. io* to the primitive *Vanessa* condition. Without raising the vexed question of sexual selection, we may yet affirm that

* The observations on the three last species are new; those on *V. atalanta*, as has been seen, are partly new and partly old. On the whole subject of the ancestral markings in *Argynnis* and *Vanessa*, see the author's paper in Trans. Ent. Soc. Lond., 1890.

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among the features induced or revived by altered temperature-conditions, there is at least a residuum which must have owed its first origin to causes other than the direct action of temperature on the organism. Nor, again, are these to be considered as cases of "arrested development"; for the stages reproduced are stages in the phylogeny of the species, not in the ontogeny of the individual.

If, then, these revived features are really ancestral, how is their revival to be accounted for? The whole subject of reversion abounds with difficulty. An explanation commonly offered is that the characters last developed in the history of a species, or of an individual, are less stable than those that have a longer history behind them, and that have become firmly established under the operation of a long-continued process of heredity. Any disturbance—such as an exceptional condition of temperature—of the normal course of growth, may therefore be expected to act in the first place on the newer and less stable features, interfering with their usual line of development, and shaking back the species as it were to an earlier and more firmly-founded stage of its development—just as in an earthquake the freshly-built wing of a house, where the mortar was not yet dry, might fall and leave the older portions standing. Such an explanation, however, is in itself at best but partial, for it gives no real reason why the newer features should be less stable than the old; and indeed it comes to little more than restating the difficulty in another form.

The two attempts to find a more definite explanation of reversion which may be said at present to hold the field, are those which pass respectively under the names of Darwin and Weismann. If the Darwinian assumption of centripetal "gemmules" be granted, the commonest case of reversion, that namely which results from hybridization, especially between recently-established species, is capable of explanation under the hypothesis of pangenesis. But it may be questioned whether pangenesis as stated by Darwin is capable of accounting for such cases as the present, inasmuch as in them the condition of full maturity is almost reached before the introduction of the modifying disturbance. Although the ovum from which the individual has originated may under the Darwinian hypothesis have contained numerous gemmules of an

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ancestral type, which though usually dormant might under certain circumstances become active in the ontogenetic process, it would yet seem a legitimate conclusion from the hypothesis, that the introduction of any cause analogous to hybridization in its action on the developing organism must belong to a far earlier stage in the ontogeny than the beginning of the pupal condition; it must belong, in fact, to the stage of fertilization of the ovum. There are, however, a few facts on record, such as the assumption of ancestral characters by an old hen (Darwin, "Animals and Plants under Domestication," 1868, vol. ii., p. 54), and the appearance of an earlier vertebrate condition in limbs of Amphibia reproduced after amputation (*Ibid.*, ii., p. 15), which seem in some respects analogous to the present instances, as being apparently cases in which a disturbance of normal conditions at a comparatively late ontogenetic stage has in some way led to reversion in the course of the individual growth. These cases are regarded by Darwin as not incompatible with pangenesis, though not fully explained by it.

If, on the other hand, we postulate with Weismann the existence of "ids" and "determinants," endowed with the nature and properties that he supposes, the instances that we are considering become more explicable. For according to this theory every feature in the structure of the individual organism is the result of a "struggle of the ids" in ontogeny, the final character of each histological unit being fixed at the moment of the liberation of its proper determinants by the disintegration of the "ids." The competition between the carriers of heredity, many of which must under the theory be ancestral in character, so far from being confined to the ovum, is being waged throughout the entire ontogeny, and is renewed at every successive stage of development. This being the case, it is to be expected that any external influence, such as temperature, on coming into force at any given stage, should be able to exert an effect upon the struggle proceeding at that particular time between determinants which are just beginning to play their parts in the ontogeny, and should in consequence be able to modify *pro tanto* the resulting adult organism. It would be, moreover, natural to expect the different determinants to be affected by different temperatures, nor would it be surprising to find that temperature-conditions, which are

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ex hypothesi diverse from those normal to the species, should favour one or other set of ancestral determinants at the expense of those more proper to the species. This would explain why the effect of heat differs from that of cold, though both lead to reversion.

There is, however, one fact which shows that the above explanation is not entirely adequate—the fact, namely, of the hereditary transmissibility of certain temperature modifications, as determined in the case of *Polyommatus phlœas* by Weismann himself ("The Germ-Plasm," 1893, p. 399). This phenomenon admits of a ready explanation under the theory of pangenesis; the point that pangenesis fails to explain is the reversionary character of the original change, unless, indeed, we suppose a "struggle of gemmules," analogous to the "struggle of determinants," and continued, like the latter, throughout the ontogeny; in which struggle certain conditions favour the ancestral rather than the modern gemmules. But just as the theory of pangenesis seems to require some such addition as that suggested, so also, under the rival hypothesis, it seems necessary to supplement the explanation above given with another supposition already propounded by Weismann, namely, that the temperature-conditions are capable, in some cases, of actually altering the constitution of unexhausted determinants wherever they occur, even in the germ plasm of the ovum itself.

I am myself inclined to think that, granting Weismann's general theory of heredity, the more special cases of reversion are to be chiefly explained, as above, by the critical influence of the temperature-conditions on the struggle of the determinants, rather than by an intrinsic effect on the determinants themselves. The latter may account for such cases as a general lightening or darkening of the ground-colour, as in Weismann's *P. phlœas*, which strictly speaking are not really but only accidentally reversionary; it will not, however, account in my opinion for the special ancestral marks shown by Mr. Merrifield's *V. atalanta* and *V. io*.

The point is capable of verification. If it be true that there is a selective influence which is exerted upon the actual struggle of the determinants, that influence would find a different expression in the adult according to the particular stage in the ontogeny at which the influence was applied, as it would affect those determinants only

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between which at that time the struggle was being waged.* If, on the other hand, there is no such influence, but the effect is entirely a direct one and modifies the individual determinant, then all the as yet unexhausted determinants that are capable of reacting to this particular disturbance would be affected in some degree; though no doubt, as Weismann supposes, to a greater extent if they had reached the point of disintegration than otherwise.

Again, it seems to me to be of great importance to ascertain if possible which of these modifications are transmissible to descendants. If all the modifications, including those which I have supposed to be produced in the first way, can be shown to be hereditarily transmissible, this would amount to a demonstration that the second explanation is adequate; and the first may then be abandoned as unnecessary. Should only some be inheritable, the presumption would be in favour of the co-existence of both modes of action; moreover, the greater the number of non-transmissible variations that can be produced, the more will the case be strengthened against pangenesis, and in favour of the "centrifugal" theory.

I am anxious to see, if possible, the results of breeding experiments on specimens like these for yet another reason. It seems to me that by comparative experiments, with and without artificial selection, on such variations as may be transmissible, a measure might be obtained of the relative importance of selection and the mere action of external influences in the transformation of a species. I think, too, that no better group for such experiments as these of Mr. Merrifield's could be selected than the Vanessas. For, in the first place, it is only among poikilothermic animals that the *direct* effects of temperature can be fully studied; then among these the Lepidoptera are pre-eminent for the extremely delicate register of variation afforded by their wings; and, lastly,

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* The fact that in *V. polychloros* forcing invariably tends to produce a certain effect, whether preceded by warming or cooling; while refrigeration brings about another definite effect, whether followed or not by forcing, seems so far favourable to this hypothesis. See above, p. 432.

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among the Lepidoptera the Vanessas belong to an assemblage the phylogeny of which may claim to be at any rate partially known.* It is hardly necessary to point out how much service may be rendered to researches of this kind by the careful working out of the true internal affinities of Lepidopterous groups. In proportion as their phylogeny is placed on a secure basis, we shall be able to pronounce with confidence on the real character, whether reversionary or not, of these remarkable variations; and shall accordingly be able to estimate at its proper value the evidence they bring towards the solution of the great problem of Heredity.

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* See the author's paper already referred to, in Trans. Ent. Soc. Lond., 1890, p. 89.

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XVII. *Description of new* Cicindelidæ *from Mashunaland.*

By Louis Péringuey, F.E.S.

[Read March 28th, 1894.]

In my "Catalogue of the South African Cicindelidæ" (Trans. South Afric. Phil. Soc. vii., 1893), I expressed, as my opinion, that this catalogue could not be regarded as final, as Gazaland and Ovampoland would, in all probability, yield new forms of the wingless genera, *Myrmecoptera, Dromica,* and *Cosmema;* but I was not prepared to receive, a few months later, no less than five *Myrmecoptera* and one *Cosmema,* hitherto undescribed, and all found in one locality of the newly-opened-up northern territories of South Africa, which will be known hereafter as Zambezia.

All these species were captured round Salisbury at the beginning of the rainy season, by my esteemed correspondent, G. A. K. Marshall, Esq., who has gone lately to reside in Mashunaland. Matabeleland and Mashunaland would seem to be the home of *Myrmecoptera,* for besides the five new species here described, Mr. Marshall has also captured the hitherto extremely rare *M. polyhirmoides,* Bates, and *M. bilunata,* Dohrn. Mr. F. E. Selous, while recruiting at Buluwayo from the effects of a wound received in the Matabele war, captured there the equally rare *M. mauchi,* Bates, and *M. limpopoiana,* Pér. These two species were very abundant, I am informed by Mr. Selous, who, however, captured only one example of each species, as he had no means of storing them. Mr. Marshall also writes that *M. invicta* and some of the other species were fairly common. I have now recorded twelve species of *Myrmecoptera* from Matabeleland and Mashunaland, and two *Cosmema.*

The other Cicindelidæ captured near Salisbury by Mr. Marshall were *Megacephala regalis,* Cicindela clathrata,*

* Occurs also near Buluwayo.

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C. disjuncta, Jansenia angusticollis, and *Cosmema lepida.* He had not met with any *Mantichora* as yet.

Gen. Cicindela, Linn.

C. mashuna, sp. n.

Supra obscure cuprea, subnitida, labro flavo utrinque bipunctato; prothorace quadrato, subtiliter granulato, albido piloso; elytris granulosis, margine sat lata, utrinque breviter tri-hamata maculisque tribus pallide flavis notata.

Obscure bronze on the upper part, with the underside of the prothorax glowing-red, and the abdomen dark blue, legs glowing-red with the tarsi green; labrum elongate, convex, tridentate at the apex, white, and with two setigerous punctures on each side, one near the median tooth, the other near the outer angle; head aciculate, with a few white decumbent hairs; prothorax short, quadrate, rugose, covered with white decumbent hairs; elytra elongate, subparallel, finely granulose, and having on each side a moderately broad, pale-yellow marginal band, sending out three short, blunt rami, and also three round spots of the same colour on each side of the suture, the posterior one of which is nearly connected with the apex of the median marginal ramus, but the median one is not at all connected with the humeral ramus, and the basal one is placed far above it; the marginal band and also the dorsal round spots are edged with dark bronze. Length, 10; width, 3 mm.

This species, which might be taken at first sight for a variety of *C. marginella,* Dej., is easily distinguished by having a sub-basal spot on each side of the suture, which could not be the interrupted end of the lateral humeral ramus, whereas the other two spots following the sub-basal one might be the continuation of the two lateral spurs.

Hab. Mashunaland (Salisbury).

Gen. Myrmecoptera, Germ.

M. angusticollis, sp. n.

Supra æneo-nigra, subnitida, subtus cyanea; capite strigoso, labro albido, nigro-marginato; prothorace cylindrico, angusto, valde elongato, transverse plicato; elytris elongatis, pone medium ampliatis, profunde punctatis, utroque plaga humerali elongata,

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fascia transversa post medium posita vittaque postica supramarginali albis ornato.

Dark metallic blue, moderately shining on the upper part, underside cyaneous; labrum white, narrowly edged with black in the male, broadly in the female; joints of antennæ foliate from the fifth to the apical one; head strigose; prothorax very narrow, cylindrical, nearly twice as long as broad, very slightly narrowed in front and behind, and finely plicate transversely; elytra very narrow at the base, gradually ampliated from the base to two-thirds of the length, convex with the sutural part ending on each side in a spine, longer and sharper in the male, broadly and deeply pitted, with the punctures deeper in the interior part, and having on each side a white humeral narrow band, a discoidal transverse post-median band narrowed in the centre, and reaching from the outer margin to two-thirds of the width of the disk, and a supramarginal narrow longitudinal band of the same colour, reaching from the rounding of the posterior part to the apex; legs cyaneous, with the knees slightly reddish. Length, 12½–13; width, 3–3¼ mm.

In shape, size, colour, and sculpture this species resembles much *M. spectabilis*, Pér.; the joints of the antennæ in *M. angusticollis* are foliate from the fifth to the apical one, whereas in *M. spectabilis* only the 4th, 5th, and 6th joints are foliate; the prothorax is still narrower than in the last-named species, and the punctures on the elytra are not so broad; the humeral white band is similar, but the posterior one is shorter, and does not unite with the transverse discoidal one.

Hab. Mashunaland (Salisbury.)

M. mashuna, sp. n.

Æneo-nigra, supra subnitida; capite strigoso, labro nigro, macula albida in medio; prothorace cylindrico, transverse plicato; elytris elongato-ovatis, utrinque quinque-costatis, costis longis, sub-undulatis, interstitiis alveolatis.

Black, moderately shining, with a bluish tinge on the head and prothorax, elytra dark bronze; labrum black, with a median yellowish white patch in the male, this patch being hardly distinct in the female; head conspicuously plicate; prothorax cylindrical, longer than broad, distinctly constricted in front and behind, and transversely plicate; elytra elongated, gradually ampliated from the base to about two-thirds of the length, convex, the male with two moderately long sutural spines, the female without any, and having

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M. Louis Péringuey on descriptions

on each side five long raised lines, the outer two [illegible] base to about three-fourths of the length, the [illegible] somewhat shorter, apical part shagreened, interv[illegible] the former with a golden sheen, no supra-marginal [illegible] hand, underside and legs very dark blue. Length [illegible] 4½-6 mm.

The nearest ally to this species is *M. [illegible]* shape of the prothorax is the same, but in *M. [illegible]* the transverse folds are more raised and with a [illegible] broader interval, the costæ of the elytra reach [illegible] nearer to the apex, and the alveolæ on the disk are more [illegible] regular.

Hab. Mashunaland (Salisbury).

M. marshalli, sp. n.

Æneo-nigra, elytris æneis, subnitidis; capite strigoso, labro nigro, in medio albo-maculato ♂; prothorace subcylindrico, antice posticeque valde constricto, transverse plicato, vitta media albo-tomentosa; elytris elongato-ovatis, utrinque quinque-costatis, costis post medium productis, interstitiis foveato-reticulatis, vitta basali alba in elytro singulo, plaga discoidali post medium posita vittaque postica supra-marginali albis.

Black with a bronze tinge, elytra brassy, moderately shining, underside and legs black, with a bluish tinge; labrum black, with a broad median yellowish-white patch in the ♂; head very obliquely plicate between the eyes, and transversely so behind; prothorax subcylindrical, only a little longer than broad, with the discoidal part somewhat raised on each side, narrowed in front and behind, transversely plicate, and with a median band of white hairs reaching from apex to base; elytra elongated, gradually ampliated from the base to about two-thirds of the length, ending in two sharp, long, sutural spines, convex, with five costæ reaching from the base to two-thirds of the length, but the first and fifth longer than the three discoidal ones, intervals foveato-reticulate, apical part shagreened, on each side a white line running on the second costa from the base to about one-fourth of the length, a more or less sublunar or rounded patch of the same colour placed at the apex of the three discoidal raised lines, and a narrow, supra-marginal posterior band, extending from the same height as the discoidal patch to the apex. Length, 12; width, 5 mm.

I know the male only. The female will probably prove

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to be more ovate and more convex, with the labrum nearly totally black.

In general facies, this species approximates to *M. polyhirmoides*, but the markings are different from those of any other *Myrmecoptera* known up to date.

Hab. Mashunaland (Salisbury).

M. formosa, sp. n.

Æneo-nigra, supra subnitida, capite strigoso, labro nigro, in medio albo-vittato; prothorace subquadrato, antice posticeque constricto, disco utrinque elevato, transverse plicato; elytris elongato-ovatis, utrinque quinque-costatis, costis undulatis, interstitiis secundo quartoque profunde-alveolatis, vitta basali alba medium disci utriusque attingente plagaque triangulari ad apicem posita albis.

Bronze-black, moderately shining on the upper part, dark metallic-blue underneath; head conspicuously strigose; labrum black, with a median whitish longitudinal band in both sexes; prothorax nearly quadrate, narrowed in front and behind, with the disk raised on each side and plicate; elytra gradually ampliated from the base to about two-thirds of the length, convex, ending in two moderately long apical spines, longer and sharper in the male than in the female, each elytron with five costæ, the first and second near the suture very wavy, and reaching from the base to two-thirds of the length, the third costa equally long, while the fourth and fifth extend further, reaching to three-fourths of the length; the intervals between the suture and the first costa and those between the second and fifth are broadly plicate, that between the first and second costæ divided into six or seven broad, deep foveæ, and the space between the fifth costa and the outer margin also broadly foveate; in the fourth interval runs a basal yellowish-white band, reaching about the median part of the disk, and there is a supra-apical, more or less triangular, broad patch of the same colour, placed below the fourth and fifth costæ; legs very dark blue. Length, 18–20; width, 5–7 mm.

Allied to *M. mauchi*, Bates, but differentiated by the broad and deep foveæ in the second interval on the elytra; the dorsal longitudinal white band is longer in proportion, and the apical one more broadly triangular.

Hab. Mashunaland (Salisbury).

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M. invicta, sp. n.

Æneo-nigra, supra-subnitida; capite strigoso, labro nigro medio albo-vittato; prothorace quadrato, antice posticeque constricto, disco utrinque elevato, transverse plicato; elytris elongato-ovatis, quinque-costatis, interstitiis reticulatis linea basali medium disci haud attingente, plagaque supra-apicali lata in singulo elytro albis.

Bronze-black, moderately shining on the upper side, underside and legs cyaneous-black; head strigose; labrum black, with a median yellowish-white longitudinal band in both sexes; prothorax quadrate, narrowed in front and behind, with the disk raised on each side and plicate; elytra gradually ampliated from the base to about two-thirds of the length, convex, ending in two acute spines, long in the male, short in the female, each elytron with five costæ reaching from the base to two-thirds of the length, with the first and second a little shorter than the other three, and the intervals reticulate; on the second costa runs a narrow white line, running from near the base to about one-third of the length, and behind, edging the dorsal costæ and extending more or less diagonally from the outer margin to the inner costa, is a sinuate silvery patch; this patch is generally broader in the ♂ than in the ♀, and I have seen a ♂ example where it had disappeared altogether. Length, 15–20; width, 5–6 mm.

A near ally to *M. mauchi*, Bates, but half the size; the sculpture of the elytra is identical, but the costæ are better defined; the inner one is shorter than the others, the fourth and fifth unite towards the apex in the male, but seldom in the female, while in the ♀ of *M. mauchi* the first and fifth costæ are the longest, and unite below the others, and the posterior patch in the last-named species is triangular, short, not transverse, nearer the apex, and below the fifth costa.

Hab. Mashunaland (Salisbury).

Gen. Cosmema, Bohem.

C. dolosa, sp. n.

Elongata, ænea, elytrorum lateribus cyaneis; capite strigoso, antennis subcompressis, foliatis; prothorace cylindrico, postice constricto, transverse plicato; elytris elongatis, postice leviter ampliatis, crebre profundeque punctatis, convexis, ad apicem utrinque bi-mucronatis, puncto humerali maculisque rotundatis supra marginem positis albis.

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Dark bronze, with a greenish tinge; the lateral parts of the elytra cyaneous; underside and legs dark greenish-blue, tibiæ rufescent; antennæ subcompressed and slightly foliate; head finely strigose diagonally; labrum black, with the apical part somewhat yellowish in the male, totally black in the female; prothorax narrow, cylindrical, constricted behind, finely transversely plicate; elytra elongated, covered with deep, closely set, moderately broad punctures, convex, with the sutural part ending in two short spines on each side, as in *C. lepida*, Boh., but much shorter, and having on each side three ovate, supramarginal white spots, the first one humeral and very small, the median one a little elongated, and the posterior one ovate. Length, 10; width, 3 mm.

This species, owing to the tendency of the antennæ to become compressed and subfoliate, connects *Cosmema* with *Myrmecoptera*; like *C. lepida*, it has two spines on each side of the suture, but these spines are not so much developed; the supramarginal white markings are not unlike those of *C. elegantula*, Boh., but in *C. dolosa* the posterior one is a round or ovate patch, not a white line or band.

Hab. Mashunaland (Salisbury.)

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XVIII. *On Pyralidina from the Malay Archipelago.* By Edward Meyrick, B.A., F.Z.S.

[Read May 2nd, 1894.]

The collection which forms the subject of this paper was made by Mr. W. Doherty, and is in the possession of Mr. H. J. Elwes, who entrusted me with types of the species for examination. The localities from which the specimens came comprise the Island of Sambawa, Celebes, Pulo Laut (Borneo), and S.E. Borneo. Many of the species are new; the large number of new and curious species of *Oligostigma* is especially remarkable. The fauna of Sambawa has evidently felt the effects of isolation, several of the species that occur there varying in a marked manner from the normal type of the same species occurring elsewhere.

PYRAUSTIDÆ.

Anisoctena, n. g.

Forehead oblique; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ with a sinuation at $\frac{1}{3}$, basal fourth with short very uneven pectinations, longest on sinuation, twice fluctuating between that and base, with a notch above basal joint surmounted by a strong tooth. Labial palpi rather long, curved, ascending, second joint much thickened with dense projecting scales, terminal joint moderate, thick, obtuse. Maxillary palpi moderate, terminally dilated with scales. Thorax in ♂ with patagia forming a dense central tuft. Abdomen in ♂ with lateral hair-tufts beyond middle, and dense black genital tuft. Posterior tibiæ with outer spurs about half inner. Forewings in ♂ with inner margin densely tufted with hairs towards base; 3, 4, 5 approximated at base, 10 approximated to 9. Hindwings densely haired above towards inner margin and on lower edge of cell towards base; 3, 4, 5 approximated at base, 7 out of 6 near origin, anastomosing with 8 to $\frac{1}{3}$.

Allied to *Margaronia*, but with many curious characters. The hairy margin of cell of hindwings is, of course, abnormal in the *Pyraustidæ*.

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A. synomotis, sp. n.

♂. 39 mm. Forewings somewhat elongate, hind margin oblique; rather dark fuscous, purplish-tinged; a darker discal mark, and an indistinct dot near before it. Hindwings rather dark fuscous.

Celebes; one specimen.

Margaronia laticostalis, Gn. Pulo Laut, Sambawa.
M. diaphanalis, Walk. Pulo Laut.
M. glauculalis, Gn. S.E. Borneo.
M. aquosalis, Snell. Celebes, S.E. Borneo.
M. pomonalis, Gn. Sambawa.
M. costiflexalis, Gn. Sambawa.
M. principalis, Walk. S.E. Borneo. This species is closely allied to *M. prothymalis*, Swinh., but differs in the form of the large postmedian blotch of the forewings, which is rounded-oblong, the two ends about equally broad, whereas in *prothymalis* the blotch is triangular, the upper end being very much broader.
M. badialis, Walk. S.E. Borneo.
M. bivitralis, Gn. S.E. Borneo.
M. actorionalis, Walk. Pulo Laut.
M. conclusalis, Walk. Sambawa.
M. bicolor, Swains. Sambawa.
M. stolalis, Gn. Pulo Laut, S.E. Borneo.

M. sphenocosma, sp. n.

♂. 19—21 mm. Antennal cilia 2. Forewings moderate, hind margin rather oblique; fuscous-whitish; two straight, oblique, dark fuscous fasciæ near base; beyond these a parallel white fascia, edged with dark fuscous; then a large transverse-oval dark fuscous spot, reaching from near costa to submedian fold; beyond this a narrow triangular white spot from costa beyond middle, edged with dark fuscous, reaching half across wing; second line slightly curved, dark fuscous; terminal area beyond this wholly fuscous; cilia fuscous, tips at anal angle white. Hindwings white; a dark fuscous streak from costa near base to anal angle; a dark fuscous median fascia, furcate above so as to enclose a triangular spot; second line straight, dark fuscous, terminal area wholly fuscous; cilia fuscous, tips white on lower half of hind margin.

Pulo Laut, S.E. Borneo; two specimens.

M. scapulalis, Ld. (*lymphatalis*, Swinh.). Pulo Laut.
M. tolumnialis, Walk. Pulo Laut.

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Omiodes hiracia, sp. n.

♂. 30 mm. Forewings rather elongate, hindmargin rather strongly oblique; fuscous, costa somewhat lighter; markings dark fuscous; first line straight, second serrate and slightly curved on upper half, strongly broken inwards in middle, thence straight; a dot beyond first line, and a discal mark: cilia fuscous, tips towards anal angle white. Hindwings grey; a darker discal dot; second line dark grey, upper half moderately curved; cilia whitish, base dark grey.

Pulo Laut; one specimen.

O. erythrias, sp. n.

♂. 20 mm. Forewings moderate, hindmargin somewhat oblique; deep brown-reddish, ochreous-tinged anteriorly, more fuscous posteriorly; lines indistinctly darker, first nearly straight, oblique, second strongly broken inwards in middle; a darker discal mark: cilia snow-white, base dark fuscous. Hindwings dark grey, mixed with dark red in disc, costa whitish, inner margin suffused with whitish; cilia as in forewings.

Celebes; one specimen.

Coptobasis radicalis, Walk. Pulo Laut.
C. lunalis, Gn. Celebes, S.E. Borneo, Sambawa.
C. monochromalis, Walk. Celebes.

TYLOSTEGA, g. n.

Face rounded; ocelli present; tongue developed. Antennæ ♀, in ♂ ciliated. Labial palpi moderate, curved, ascending, second joint with dense somewhat rough scales beneath, terminal joint moderate, obtuse or somewhat pointed. Maxillary palpi moderate, filiform. Abdomen rather long. Posterior tibiæ with outer spurs less than half inner. Forewings in ♂ above with impression in cell containing a small flat scale-tuft, beneath with depression covered by dense pecten of scales from upper edge (in ♀ also present, but less developed); 3, 4, 5 closely approximated towards base, 10 closely approximated to 9. Hindwings with 3, 4, 5 closely approximated towards base, 7 out of 6, anastomosing with 8 to middle.

Nearly allied to *Aripana*, from which it differs mainly in the scale-pecten of the forewings, and the shorter and less acute terminal joint of palpi. Type *T. chrysanthes*.

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T. chrysanthes, sp. n.

♂ ♀. 17—19 mm. Antennal cilia of ♂ 3. Forewings rather elongate, hindmargin somewhat obliquely rounded; orange, irregularly blotched with fuscous; lines rather irregular, dark fuscous, forming blackish spots on costa, first hardly curved, second at ⅔ acutely angulated to below middle of disc, and again acutely angulated to inner margin; a blackish discal mark; an almost hindmarginal row of blackish spots: cilia orange, base obscurely fuscous-spotted. Hindwings as forewings, but first line absent.

Pulo Laut; two specimens.

T. mesodora, sp. n.

♂. 19 mm. Differs from *T. photias* as follows: antennal cilia 1½; forewings somewhat shorter and broader, costal streak more orange-tinged, hindmargin with a slender orange streak preceded by a series of blackish spots; hindwings shorter and more rounded, marked as in forewings, except that there is a broad ochreous-whitish antemedian band.

Pulo Laut; one specimen.

T. photias, sp. n.

♂. 20—21 mm. Antennal cilia 1. Forewings rather elongate, hindmargin somewhat obliquely rounded; fuscous; inner margin suffused with ochreous towards middle; a suffused pale ochreous streak along costa, with a projection beyond second line; lines dark fuscous, forming blackish spots on costa, first hardly sinuate, second sinuate, acutely angulated from near anal angle to below middle of disc, thence again to inner margin, but obsolete at extremity; a blackish discal mark; a blackish hindmarginal streak, including a series of whitish dots: cilia whitish-grey, base dark grey. Hindwings whitish: base fuscous; a broad rather dark fuscous hindmarginal band, anterior edge suffused with ochreous; a fuscous mark in disc near before this; a hindmarginal series of connected white dots; cilia as in forewings.

Pulo Laut, S.E. Borneo; two specimens.

T. (?), *poltisalis*, Walk. Pulo Laut; a ♀; the generic reference is therefore doubtful.

T. schematias, sp. n.

♂ ♀. 19—21 mm. Antennal cilia of ♂ minute. Forewings somewhat elongate, hindmargin rather obliquely rounded; ochreous-yellow; five small round black spots, viz., one on costa at ⅓, two on inner margin before middle and towards anal angle,

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one near hindmargin below middle, and one at apex; a black transverse mark from costa beyond middle; cilia ochreous-yellowish, tips paler. Hindwings pale ochreous-yellowish; a small black spot at apex, and another on middle of hindmargin.

Pulo Laut, S.E. Borneo, Sambawa, Celebes; four specimens. In the Celebes specimen the spots are partially indistinct.

Aripana meritalis, Walk. Sambawa.

A. abdicalis, Walk. Pulo Laut, S.E. Borneo, Sambawa.

A. lactiferalis, Walk. (*paucipunctalis*, Snell.). Pulo Laut, Celebes.

A. glaucias, sp. n.

♂. 28 mm. Forewings white; a greyish-ochreous subcostal streak from base to beyond middle; black basal and subbasal dots on costa, one beneath costa beyond these, and one on inner margin towards base; lines broad, fascia-like, pale greyish-ochreous, first obsolete on upper half, second hardly curved, regular; a round black discal spot; a black dot on costa at $\frac{2}{3}$, and another, whitish-centred, on costal end of second line; a pale greyish-ochreous hindmarginal streak, preceded by a black dot below middle: cilia pale greyish-ochreous, tips paler. Hindwings white; a black discal dot; second line and posterior markings as in forewings.

Pulo Laut; one specimen. Specially distinguished by the large size, and broad fascia-like regular second line; nearest to *A. lactiferalis*, but differs from it also by the black dorsal dot towards base.

Rehimena phrynealis, Walk. Pulo Laut.

Conogethes clioalis, Walk. Sambawa.

C. haemactalis, Snell. Pulo Laut, Sambawa.

C. punctiferalis, Gn. Pulo Laut, Celebes, Sambawa.

C. iopasalis, Walk. Sambawa.

C. nilalis, Walk. (— *usalis*). Pulo Laut.

*C. subliturali*s, Walk. Celebes, Sambawa.

Nosophora scotaula, sp. n.

♂. 27 mm. Forewings moderate, hindmargin obliquely rounded; dark fuscous. Hindwings dark fuscous.

Pulo Laut; one specimen. The sexes in the genera *Nosophora* and *Analthes* appear to differ strikingly in some cases at least, and their relationships are at present imperfectly understood. I consider it just possible that this might be the ♂ of the very different *N. congenitalis*, of which I have seen only ♀s.

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N. ochnodes, Meyr. Pulo Laut.
N. chironalis, Walk. Pulo Laut.
N. congenitalis, Walk. Pulo Laut.

Analthes semitritalis, Ld. Pulo Laut.
A. idyalis, Walk. (*disjunctalis*, Walk.) Pulo Laut, Celebes. I consider it nearly certain that the forms described under these two names are sexes of the same species.
A. pyrrhocosma, sp. n.

♀. 19 mm. Forewings rather elongate, hindmargin rather oblique; yellow; markings deep brown-red; a costal streak, costal edge dark fuscous; a basal spot, connected by a subcostal streak with first line; lines irregular, first nearly straight, second at $\frac{2}{3}$ abruptly bent round to connect with discal spot, thence again abruptly bent to inner margin; discal spot transverse-oblong, containing a pale mark, and touching costal streak; a broad, irregular hindmarginal band, partially touching second line: cilia blackish. Hindwings deep brown-red; basal half, a large oval postmedian spot, and a spot on middle of hindmargin yellow; apex suffused with blackish: cilia blackish.

S.E. Borneo; one specimen.

Meroctena tullalis, Walk. Pulo Laut.
M. Staintonii, Ld. Pulo Laut.

Merotoma, g. n.

Face rounded; ocelli present; tongue developed. Antennæ $\frac{3}{4}$, in ♂ moderately ciliated. Labial palpi moderate, subascending, second joint much thickened with dense projecting scales beneath, terminal joint very short, concealed. Maxillary palpi moderate, filiform. Posterior tibiæ in ♂ extremely short, $\frac{1}{5}$ of tarsi, furnished with large tuft of hairs above, outer middle spur absent, inner middle spur greatly dilated and enlarged. Forewings with 3, 4, 5 approximated at base, 10 approximated to 9. Hindwings in ♂ with inner marginal pencil of hairs; 3, 4, 5 approximated at base, 7 out of 6 near origin, anastomosing with 8 to $\frac{1}{3}$.

M. dairalis, Walk. Pulo Laut, Celebes.

Sagariphora, g. n.

Forehead rounded; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ moderately ciliated. Labial palpi moderately long, curved, ascending, second joint with dense rough projecting scales beneath, terminal joint rather long, with triangular tuft in front. Maxillary

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palpi moderate, filiform. Abdomen rather long. Posterior tibiæ in ♂ strongly dilated with dense scale-tufts above and beneath on lower half, basal joint of tarsi with dense rough scales beneath. Forewings with 3, 4, 5 approximated at base, 10 approximated to 9. Hindwings in ♂ with inner marginal tuft of hairs; 3, 4, 5 approximated at base, 7 out of 6 near origin, anastomosing with 8 to $\frac{1}{3}$.

Nearly allied to *Agrotera*.

S. heliochlaena, sp. n.

♂. 28 mm. Forewings moderate, hindmargin rather strongly oblique; ochreous-brownish, orange-tinged; basal half ochreous-yellow mixed with ferruginous-orange, limited by a rather curved line; second line formed by blackish dots, irregular: cilia ochreous-brown, tips darker. Hindwings yellowish, paler anteriorly; a cloudy longitudinal streak of blackish irroration from middle of disc to hindmargin.

Sambawa; one specimen.

Agrotera effertalis, Walk., Celebes.

Aetholix flavibasalis, Gn., S.E. Borneo.

SAROSCELIS, g. n.

Characters of *Notarcha*, but posterior tibiæ in ♂ with dense tuft of hairs.

S. nicoalis, Walk. Sambawa, S.E. Borneo.

Dichocrocis pandamalis, Walk. (*frenatalis*, Ld.) Pulo Laut, S.E. Borneo, Sambawa. This species varies considerably in size, and in the form and position of the second line of forewings. The Sambawa specimens have the lines finer than those from Borneo.

Notarcha (?) *nigrofimbrialis*, Snell. Celebes.

N. quaternalis, Z. Sambawa.

N. compsogramma, sp. n.

♀. 23 mm. Forewings moderate, hindmargin rather obliquely rounded; whitish-yellowish; two straight orange subbasal transverse streaks, first black-dotted on costa; lines rather thick, orange, marked with black spots on costa, first straight, second moderately broken inwards below middle; a round black discal spot; a suffused orange subterminal streak: cilia whitish, with blackish basal and grey median lines. Hindwings as forewings, but without subbasal

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lines or black costal spots, discal spot orange, not touching either line.

Sambawa; one specimen. Differs from *N. tigrina*, Moore, chiefly in the discal spot of hindwings not being connected with the second line.

N. pyrrhalis, Walk. Pulo Laut.

N. pyranthes, sp. n.

♀. 21 mm. Forewings moderate, hindmargin rather obliquely rounded; ochreous-yellow; markings blackish; subbasal and first lines straight; a transverse discal spot outlined with blackish, connected by a line with inner margin; an oblique streak from costa near apex, reaching half across wing; a straight streak from apex to inner margin before anal angle, and a hindmarginal streak, confluent at apex: cilia shining grey, base yellow. Hindwings ochreous-yellow, with an orange anal blotch; discal spot blackish, connected by a bent line with anal angle; an oblique blackish spot before apex, and a narrower mark before middle of hindmargin; a black hindmarginal streak: cilia as in forewings.

S.E. Borneo; one specimen.

N. rigidalis, Snell. Pulo Laut.

N. xuthalis, Walk. (— *usalis*) (*onustalis*, Snell.) S.E. Borneo.

N. multilinealis, Gn. Pulo Laut, Celebes, Sambawa.

N. charesalis, Walk. (*octasema*, Meyr.) S.E. Borneo.

N. homomorpha, sp. n.

♂. 27 mm. Legs white, anterior pair banded with black. Forewings moderate, hindmargin rather obliquely rounded; light ochreous-brown; lines blackish, interrupted, first rather irregular, second serrulate, sinuate on upper $\frac{2}{3}$, thence abruptly broken inwards to below middle of disc; a blackish dot in disc immediately beyond first line, and a small blackish discal spot; an interrupted blackish hindmarginal streak: cilia light brownish, basal half barred with blackish. Hindwings light ochreous-grey, darker grey towards apex; a darker grey discal mark; second line faintly darker, formed as in forewings; a blackish hindmarginal streak: cilia grey-whitish, basal half dark grey.

Pulo Laut; one specimen.

N. unitalis, Gn. Pulo Laut.

N. iophanes, sp. n.

♂. 35 mm. Abdomen with two expansible tufts of hairs at base above. Forewings rather elongate, hindmargin rather oblique;

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fuscous, purplish-tinged, costa and terminal area dark fuscous; a small purple-whitish spot in disc before very indistinct first line; a small dark fuscous spot in disc beyond first line, and a transverse dark fuscous discal spot, separated by a larger square purple-whitish spot, and followed by a small purple-whitish spot; two obscure purple-whitish spots between veins beneath central spot; second line dark fuscous, upper $\frac{2}{3}$ curved outwards, edged posteriorly by a whitish line ending in a rather large subcostal and small subdorsal spot: cilia dark fuscous. Hindwings fuscous, with a broad dark fuscous terminal band; a dark fuscous discal spot, and twice strongly sinuate second line: cilia dark fuscous, towards tips whitish on upper half of hindmargin.

S.E. Borneo; one specimen.

N. decialis, Walk. (— *usalis*). Pulo Laut.

Pleuroptya aurantiacalis, F.R. Pulo Laut, S.E. Borneo.

METOPORTHA, g. n.

Forehead rounded, with long projecting spreading tuft of hairs from between antennæ; ocelli present; tongue developed. Antennæ $\frac{3}{4}$, in ♂ ciliated, with a sinuation and slight thickening of rough scales on stalk rather near base, basal joint enlarged. Labial palpi rather long, ascending, second joint rather shortly rough-scaled, terminal joint moderate, obtuse. Maxillary palpi moderate, terminally dilated with scales. (Legs broken.) Forewings with 3, 4, 5 approximated at base, 10 approximated to 9. Hindwings with 3, 4, 5 approximated at base, 7 out of 6 near origin, anastomosing with 8 to $\frac{1}{3}$.

M. dolopsalis, Walk. Pulo Laut.

Phlyctaenia itemalesalis, Walk. Sambawa.

Pyrausta inscisalis, Walk. Sambawa.
P. celatalis, Walk. Pulo Laut.
P. ciniferalis, Walk. Pulo Laut, S.E. Borneo.
P. ablactalis, Walk. S.E. Borneo, Celebes, Sambawa.
P. damastesalis, Walk. Sambawa.
P. detritalis, Gn. Pulo Laut.
P. marginalis, Moore. S.E. Borneo.

CRYPSIPTYA, g. n.

Characters of *Pyrausta*, but antennæ $\frac{5}{6}$, thorax in ♂ beneath with large lateral extensible plate of greatly elongated scales.

C. nereidalis, Ld. Pulo Laut, S.E. Borneo.

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Isocentris aequalis, Ld. Celebes.

Ischnurges gratiosalis, Walk. Pulo Laut, S.E. Borneo.
I. octoguttalis, Feld. S.E. Borneo.

Dasyscopa, g. n.

Characters of *Scoparia*, but hindwings in ♂ with subdorsal groove, hairy above and filled beneath with dense hairs and with a dense tuft of hairs from middle of its inner edge, outer edge with long fine spreading hairs, 4 and 5 widely remote, parallel.

D. homogenes, sp. n.

♂. 16 mm. Forewings elongate, hindmargin rather oblique; pale grey, mixed with whitish and coarsely sprinkled with blackish; a short black irregular streak from middle of base; lines whitish, first nearly straight, edged posteriorly with blackish, second obtusely angulated above middle; two small blackish spots representing orbicular and claviform touching black edge of first line; discal spot irregular, blackish; a broad irregular whitish subterminal line, interrupted in middle. Hindwings pale grey; tufts of subdorsal groove blackish.

Sambawa; one specimen.

Ischnoscopa, g. n.

Characters of *Scoparia*, but forewings with 7 absent, hindwings with 5 absent.

I. chalcozona, sp. n.

♂ ♀. 9—10 mm. Labial palpi elongate, pointed. Forewings elongate, hindmargin rather strongly oblique; dark fuscous, purplish-tinged; lines rather thick, yellow, first hardly curved, second angulated in middle. Hindwings dark grey.

Sambawa, over 3,000 feet; three specimens.

Endographis, g. n.

Forehead rounded; ocelli present; tongue developed. Antennæ ⅘, in ♂ moderately ciliated. Labial palpi moderate, ascending, second joint with long dense projecting scales beneath, terminal joint rather short, obtuse. Maxillary palpi moderate, filiform. Abdomen in ♂ with two or three long filaments from each side above middle. Posterior tibiæ with outer spurs half inner. Forewings with 3, 4, 5 approximated at base, 10 approximated to 9. Hindwings in ♂ with deep subdorsal groove, inner margin folded over beneath and prolonged into a stiff projection at anal angle;

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4 and 5 short-stalked from point with 3, 7 out of 6 near origin, anastomosing with 8 to middle.

A genus of uncertain affinity.

E. acrochlora, sp. n.

♂. 15 mm. Forewings moderate, apex rectangular, hindmargin rather oblique; whitish-fuscous; costa suffused with whitish-ochreous, more clearly posteriorly; lines dark grey, indistinct, forming blackish marks on costa, first curved, second strongly curved on upper ¾; an indistinct dark grey discal mark: cilia grey, with a blackish line, base ochreous-white. Hindwings grey, more whitish towards base and inner margin; second line dark grey, partially indistinct: cilia as in forewings, on lower half of hindmargin wholly whitish-grey.

Pulo Laut; one specimen.

Stenia fauculalis, Walk. S.E. Borneo.

Metasia hilarodes, sp. n.

♂. 20 mm. Antennal cilia minute. Forewings moderate, hindmargin obliquely rounded; yellow-ochreous; lines fuscous, first indistinct, second black-dotted on costa, followed by three semi-transparent whitish dots on upper third, abruptly curved outwards on middle third, thence strongly broken inwards and obsolete to beneath middle of disc, whence it is continued to inner margin; a fuscous discal mark, preceded by a quadrate semi-transparent whitish spot, beneath which is another similar anteriorly dark-edged spot preceding second line; three dark fuscous dots on costa posteriorly: cilia ochreous-yellow, tips paler. Hindwings ochreous-yellow; second line as in forewings, but without whitish spots.

Borneo (?); one specimen.

M. tampialis, Walk. (— *usalis*). Pulo Laut, S.E. Borneo.

M. didasalis, Walk. Sambawa.

M. melesalis, Walk. S.E. Borneo.

METASIODES, g. n.

Characters of *Metasia*, but face without prominence, labial palpi ascending, rough-scaled beneath, terminal joint short, obtuse.

M. achromatias, sp. n.

♂. 14—16 mm. Antennal cilia 1⅓. Forewings elongate, hindmargin rather strongly oblique; grey-whitish, irregularly mixed

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with dark grey; some black scales towards base; lines black, first nearly straight, followed by a small black subcostal spot touching it, second irregular, from $\frac{4}{5}$ of costa to near anal angle, thence strongly curved round to below middle of disc, and again bent to inner margin at $\frac{3}{4}$; a transverse discal spot outlined with black; three small blackish spots on posterior half of costa besides extremity of second line; a dark grey spot on middle of hindmargin; a hindmarginal row of blackish dots: cilia whitish, basal half spotted with blackish-grey. Hindwings with colour, second line, hindmarginal dots, and cilia as in forewings.

Sambawa; two specimens.

M. calliophis, sp. n.

♂. 13 mm. Antennal cilia 1. Forewings rather elongate, hindmargin oblique; ochreous-yellow; a black spot on base of costa; lines black, forming spots on costa, first nearly straight, second irregularly sinuate from $\frac{3}{4}$ of costa to near anal angle, thence strongly curved round to beneath middle of disc, and again bent to inner margin at $\frac{2}{3}$; orbicular and transverse discal spots outlined with black; a small black spot on anal angle, and four black dots on upper half of hindmargin: cilia whitish, with a dark grey line. Hindwings with colour, second line, anal spot, and cilia as in forewings; a black discal dot; a black streak along upper half of hindmargin.

Pulo Laut; one specimen.

M. lilliputalis, Snell. (?) Sambawa.

M. tholeropa, sp. n.

♂. 9 mm. Antennal cilia 4. Forewings elongate, hindmargin rather oblique; whitish-fuscous, irregularly mixed with dark fuscous; costa blackish towards base; lines black, forming spots on costa, first nearly straight, second rather irregular from $\frac{4}{5}$ of costa to anal angle, which it touches, thence acutely angulated to beneath middle of disc, and again strongly curved round to inner margin at $\frac{3}{4}$; a blackish subcostal spot beyond and touching first line; discal spot transverse-oblong, outlined with black; costa ochreous-whitish on posterior half, with a small black spot in middle, and a dot between this and second line; a hindmarginal series of connected black dots: cilia whitish, with a blackish somewhat interrupted line. Hindwings with colour, second line, and cilia as in forewings; a black discal dot; a waved black hindmarginal line.

Sambawa; one specimen.

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M. œaxalis, Walk. S.E. Borneo.

Tabidia insanalis, Snell. Celebes.
T. aculealis, Walk. (*trisignata*, Moore) Pulo Laut.
T. craterodes, sp. n.

♂ ♀. 19—22 mm. Differs from *T. insanalis* as follows:—colour more whitish, markings thicker and darker, especially hind-marginal band; forewings with upper half of discal spot almost wholly dark; hindwings with first line connected by suffused longitudinal streaks with base, a well-marked blackish discal spot beyond and more or less connected beneath with first line, second line distinctly curved (in *insanalis* straight); apex of abdomen in ♂ rather dark fuscous beyond the silvery-white subapical ring.

Pulo Laut; two specimens.

SYNTOMCDORA, g. n.

Forehead rounded; ocelli present; tongue developed. Antennæ ½, in ♂ serrate, shortly ciliated. Labial palpi moderately long, curved, ascending, second joint with rather long dense projecting scales beneath, terminal joint moderately long, pointed. Maxillary palpi moderate, filiform. Abdomen rather long. Posterior tibiæ with outer spurs ½—¾ of inner. Forewings with 3, 4, 5 approximated at base, 10 approximated to 9. Hindwings with 4 and 5 stalked from near 3, 7 out of 6 near origin, anastomosing with 8 to middle.

Apparently allied to *Tabidia*.

S. thoasalis, Walk. Celebes.

Ptilaeola collaris, Walk. Pulo Laut, Sambawa.
P. zebinalis, Walk. S.E. Borneo.

Archernis callixantha, Meyr. Pulo Laut.

Diathrausta profundalis, Ld. Sambawa.

Diasemia grammalis, Dbld. S.E. Borneo, Sambawa.

Agathodes ostentalis, Hb. Sambawa.

Syngamia castoralis, Walk. (*purpurescens*, Moore). Pulo Laut.

Cnaphalocrocis medinalis, Gn. S.E. Borneo.

Stegothyris diagonalis, Gn. Sambawa.

Pagyda salvalis, Walk. Pulo Laut.
P. amphisalis, Walk. Pulo Laut.

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Platamonia ampliatalis, Ld. Celebes.
P. camillalis, Walk. Pulo Laut.
P. ptochura, sp. n.

♂. 23 mm. Abdomen with two dark fuscous subapical rings, not marked with white. Forewings moderate (broader than in *camillalis*), hindmargin rather obliquely rounded: pale ochreous-yellowish; a broad costal suffusion, broadest before middle, and a broad hindmarginal band dark fuscous; lines blackish, partially indistinct, first hardly curved; second rectangularly but obsoletely broken inwards in middle; a blackish linear discal mark: cilia whitish, with a grey line. Hindwings with colour, second line, hindmarginal band, and cilia as in forewings.

Pulo Laut; one specimen.

Pleonectusa macaralis, Walk. Pulo Laut, Sambawa.

Cometura lirisalis, Walk. (*picrogramma*, Meyr.) S.E. Borneo.

Nistra caelatalis, Walk. S.E. Borneo, Sambawa, Celebes.

Hydriris elutalis, Walk. Pulo Laut.
H. ornatalis, Dup. Pulo Laut, S.E. Borneo, Sambawa.
H. retractalis, Walk. (*opalina*, Moore). Pulo Laut, S.E. Borneo, Sambawa.

Caprinia felderi, Ld. Pulo Laut.

Pinacia fulvidorsalis, Hb. Sambawa.

Siriocauta testulalis, Hb. Sambawa.

Nausinoe globulipedalis, Walk. (*columalis*, Snell.) Celebes.
N. euroalis, Swinh. (*rivulalis*, Snell.) Pulo Laut.
N. conchylia, sp. n.

♂. 20 mm. Forewings elongate, hindmargin very oblique, sinuate above anal angle; cell with an irregular impression beneath, 2—5 approximated at base, 10 out of 9; prismatic whitish, thinly scaled; markings rather dark fuscous, ochreous-tinged; first line irregular, indistinct, furcate towards inner margin, second forming an angular projection posteriorly in middle; discal spot formed by a large oval ring, lower extremity connected with second line; an irregular subterminal fascia, dilated to touch hindmargin in middle. Hindwings broad, veins 2—5 closely approximated at base, 7 anastomosing with 8 almost to apex; prismatic whitish, thinly

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scaled; markings rather dark fuscous; a discal spot, lower extremity touching a large dorsal suffusion; an apical blotch; a triangular spot on hindmargin below middle.

Pulo Laut; one specimen.

N. trogalis, Walk. (*ommatalis*, Snell.) Pulo Laut.
N. lindalis, Walk. Sambawa.

SYMMORACMA, g. n.

Forehead somewhat prominent; ocelli present; tongue developed. Antennæ 1, in ♂ slender, simple, in ♀ minutely ciliated. Labial palpi moderate, porrected, clothed with dense projecting scales. Maxillary palpi moderate, filiform. Abdomen in ♂ very long. Posterior tibiæ with outer spurs about half inner. Forewings with 3, 4, 5 approximated at base, 10 out of 9. Hindwings with 3, 4, 5 approximated at base, 7 out of 6 near origin, thence coinciding with 8 to apex.

Probably related to *Nausinoe*.

S. spodinopa, sp. n.

♂ ♀. 19—20 mm. Forewings elongate, hindmargin oblique; purplish-grey, irrorated with black; a small white spot on submedian fold before middle; a white crescentic discal mark; second line whitish, middle third curved outwards; a hindmarginal row of white dots: cilia grey. Hindwings grey; a fine darker postmedian line, formed as in forewings.

Sambawa; two specimens.

Orphnophanes euceralis (— *usalis*) (*productalis*, Ld.) S.E. Borneo.

PERISYNTROCHA, g. n.

Forehead rounded; ocelli present; tongue developed. Antennæ almost 1, in ♂ very shortly ciliated. Labial palpi moderate, ascending, second joint rough-scaled beneath, terminal joint short, obtuse. Maxillary palpi short, filiform, pointed. Abdomen in ♂ long. Posterior tibiæ with outer spurs about half inner. Forewings with 4 and 5 stalked, 10 out of 9. Hindwings with 4 and 5 stalked, 7 out of 6 near origin, anastomosing with 8 to middle.

Allied to *Nausinoe*.

P. alienalis, Walk. (*cuneolalis*, Snell.; *picata*, Butl.) Pulo Laut.

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Mixophyla renatalis, Walk. (— *usalis*) (*erminea*, Moore). Sambawa.

Pterygisus fœdalis, Gn. Sambawa, Pulo Laut.

Cymoriza fulvobasalis, Snell. S.E. Borneo.

Hydrocampa oxygona, sp. n.

♂. 21 mm. Forewings fuscous; lines slender, white, first curved, second angulated beneath costa, at $\frac{2}{3}$ abruptly curved upwards to middle of disc, thence again abruptly curved downwards, angulated above dorsum; a subterminal row of uneven white dots. Hindwings fuscous, lighter in disc; extreme base and a subbasal line whitish; lines slender, white, first hardly curved, second forming an acute angular prominence in middle; a round blackish discal spot; a subterminal row of white dots.

Sambawa; one specimen.

Nymphula irialis, Walk. (— *usalis*). Pulo Laut.
N. responsalis, Walk. S.E. Borneo.
N. turbata, Butl. S.E. Borneo.
N. diminutalis, Snell. S.E. Borneo.
N. villidalis, Walk. (*unilinealis*, Snell.) S.E. Borneo.

Oligernis, g. n.

Forehead rounded; ocelli present; tongue developed. Antennæ $\frac{1}{4}$, in ♂ serrate, minutely ciliated. Labial palpi long, curved, ascending, second joint loosely scaled beneath, terminal joint nearly as long, acute. Maxillary palpi moderate, with loose spreading scales. Posterior tibiæ with outer spurs almost as long as inner. Forewings with 3, 4, 5 approximated at base, 10 out of 9, 11 absent. Hindwings with 3 and 4 from a point, 7 out of 6 near origin, anastomosing with 8 to near middle.

A specialised development of *Nymphula*. Type, *O. endophthalma*.

O. endophthalma, sp. n.

♂. 11 mm. Forewings elongate-triangular, apex rectangular, hindmargin bowed, little oblique; white; basal area suffused with light fuscous; first line white, indistinct, edged on costa with ochreous-yellow, elsewhere with a cloudy dark fuscous suffusion; an ochreous-yellow streak from middle of first line to $\frac{3}{4}$ of disc, thence angulated to costa at $\frac{4}{5}$; a similar ochreous-yellow streak beneath and parallel to this, but more curved, not reaching costa.

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Hindwings white; first line white, indistinct, edged with a cloudy dark fuscous suffusion; posterior half mostly occupied by three ochreous-yellow blotches, apical, central, and anal.

S.E. Borneo; one specimen.

O. leucochrysa, sp. n.

♀. 12 mm. Forewings elongate-triangular, apex rectangular, hindmargin bowed, little oblique; white; markings ochreous-yellow; margins of first line formed by two interrupted streaks; two parallel streaks from middle of disc to $\frac{3}{4}$, thence angulated to costa before apex; a submarginal streak, finely edged with blackish anteriorly. Hindwings white; three ochreous-yellow rather irregular transverse fasciæ, second dilated in disc; submarginal streak as in forewings.

S.E. Borneo; one specimen. A third species of the same genus is in the collection from the same locality, but not in condition to describe.

Oligostigma ceratucha, sp. n.

♂ ♀. 19—24 mm. Antennæ in ♂ with eight lowest joints of stalk clothed with long suberect scales above. Forewings very elongate-triangular, hindmargin very oblique, rounded, in ♂ with costal edge very narrowly folded over beneath on basal $\frac{2}{3}$, and roughly hairy towards base; 10 and 11 out of 9; shining white; a fuscous costal streak from base to middle; a broad ochreous-yellow dorsal streak from base to anal angle, enclosing a narrow fuscous dorsal streak towards middle, tending to be connected by an indistinct fuscous suffusion with costa; a fuscous triangular blotch on costa beyond middle, subcostal vein in this finely white; a yellow-ochreous streak, suffused with fuscous posteriorly, from costa at $\frac{4}{5}$ to apex of costal blotch; an ochreous-yellow finely black-edged hindmarginal streak, enclosing a hindmarginal series of fine white lunulate marks. Hindwings abruptly sinuate below apex, in ♂ with strong rounded anal prominence, and deep subdorsal furrow beneath; ochreous-yellow; a white fuscous-edged fascia before middle; a white fascia beyond middle, not reaching margins, edged anteriorly with fuscous and posteriorly with black; an interrupted black hindmarginal line, forming two small spots below subapical sinuation, upper preceded by a silvery-white black-edged dot.

Pulo Laut; two specimens.

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O. endosaris, sp. n.

♂. 18 mm. Forewings very elongate-triangular, hindmargin very oblique, rounded, posterior end of cell forming a subhyaline impressed patch, inner margin with abnormally long cilia; 10 out of 9; light fuscous; a small dark fuscous spot on middle of costa, preceded by a yellowish spot; a deep yellow transverse spot in disc beyond middle; two shining white posterior streaks from costa, first reaching to $\frac{2}{3}$, second to near dorsum, space between them deep yellow anteriorly, second followed by a deep yellow anteriorly blackish-edged hindmarginal fascia; a hindmarginal row of blackish dots. Hindwings abruptly sinuate below apex, in ♂ at anal angle with a large rough tuft of mixed black and whitish hairs; deep yellow; a white fuscous-edged fascia before middle; apex white, with black marginal and submarginal lines; an interrupted black hindmarginal line, forming two or three spots below subapical indentation, upper preceded by a silvery-white black-edged spot.

Pulo Laut; one specimen.

O. orthoteles, sp. n.

♂ ♀. 20—23 mm. Posterior femora in ♂ with a large dense rough tuft of whitish and black hairs beneath. Forewings very elongate-triangular, hindmargin straight, rather strongly oblique; 10 out of 9; shining white; a deep ochreous-yellow streak along costa from base to middle, thence to $\frac{3}{4}$ of disc; a black mark on middle of costa; a cloudy blackish median line from base to beyond middle of disc, thence bent downwards to near anal angle, and again acutely angulated to costa at $\frac{3}{4}$, where it forms a yellow spot; a deep ochreous-yellow dorsal streak from before middle to anal angle; a deep ochreous-yellow posteriorly fuscous-edged fascia at $\frac{5}{6}$, finely attenuated downwards, not reaching anal angle; a deep ochreous-yellow black-edged hindmarginal fascia. Hindwings angularly indented below apex; deep ochreous-yellow; a shining white black-edged median fascia; black submarginal and marginal lines, latter interrupted to form three black spots below subapical indentation, uppermost preceded by a white black-edged spot.

Sambawa; two specimens.

O. aureolalis, Snell. Sambawa.
O. ochreipicta, Moore. Celebes.
O. idiotis, sp. n.

♂. 18 mm. Forewings elongate-triangular, hindmargin bowed, oblique; 10 out of 9; fuscous mixed with orange, costa and

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inner margin suffused with orange; a white subterminal streak, not reaching inner margin, preceded by a rather darker fascia, and followed by an orange black-edged hindmarginal fascia. Hindwings abruptly sinuate below apex; brownish-orange; a grey, darker-sprinkled patch occupying anterior half, except extreme base and inner margin; a slender whitish subterminal streak on dorsal half, edged anteriorly with fuscous, and posteriorly with black; a whitish, fuscous-edged anteapical dot; a black hindmarginal line on lower half, forming three black spots below subapical sinuation, two upper quadrate and edged anteriorly by white black-edged spots.

Celebes; one specimen. Very like *O. ochreipicta*, but entirely without the strongly-developed costal fold and dorsal protuberance of that species.

O. gibbosalis, Gn. (*plicatalis*, Walk.; *hamalis*, Snell.) Celebes, Sambawa; the Celebes form has the triangular costal postmedian blotch in ♂ wholly brown, the Sambawa form partly white; in the ♀ of both forms the blotch is similar, mostly white.

O. tripunctalis, Snell. Sambawa.

O. melanodes, sp. n.

♀. 12 mm. Forewings very elongate-triangular, hindmargin rounded, rather strongly oblique; 10 out of 9; dark fuscous, whitish-sprinkled; a whitish streak from costa at ¾, reaching half across wing; a subterminal white streak, not reaching inner margin, followed by a brownish-orange, blackish-edged hindmarginal streak. Hindwings abruptly sinuate below apex; dark fuscous; three black orange-edged hindmarginal spots below sinuation, preceded by white spots.

S.E. Borneo; one specimen.

O. argyropis, sp. n.

♂ ♀. 16—20 mm. Middle femora in ♂ beneath with tuft of long white hairs. Forewings very elongate-triangular, hindmargin rounded, oblique, inner margin in ♂ forming a strong triangular prominence at ⅓; 10 out of 9, 11 closely approximated; shining white; a dark fuscous costal streak from base to ⅘, lower edge forming a triangular projection beyond middle; a light yellowish curved streak from ⅓ of inner margin to beneath this projection; a rather broad orange hindmarginal fascia, edged with black marks or dots, enclosing a fine silvery blackish-edged subterminal streak.

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Hindwings abruptly sinuate below apex ; shining white, posteriorly suffused with light yellow-ochreous, becoming orange on hindmargin ; a silvery submarginal streak before apex ; five black hindmarginal dots below sinuation, preceded by silvery-metallic blackish-edged dots.

Celebes ; two specimens.

O. basilissa, sp. n.

♂. 16 mm. Posterior tibiæ with two spreading tufts of hairs at origin of spurs beneath. Forewings elongate-triangular, hindmargin bowed, rather strongly oblique ; inner margin forming a strong triangular prominence at $\frac{1}{3}$; 10 out of 9, 11 closely approximated ; shining white ; an orange costal streak from base to $\frac{1}{4}$, lower edge forming a strong triangular posteriorly blackish-margined projection beyond middle ; a broad ochreous-yellow dorsal streak from base to $\frac{3}{4}$, enclosing a blackish dorsal streak from $\frac{1}{3}$ to $\frac{2}{3}$; a rather broad orange hindmarginal fascia, edged anteriorly by a black streak not reaching inner margin, and enclosing a silvery-white black-edged subterminal streak ; an interrupted black hindmarginal line, forming a small spot at apex. Hindwings abruptly sinuate below apex ; shining white, posteriorly suffused with light ochreous-yellow, anterior edge of suffusion marked with two black spots in disc ; an orange hindmarginal streak, at apex preceded by a silvery-metallic line, below sinuation marked with five round black spots anteriorly edged with silvery-metallic.

Sambawa ; one specimen.

Margarosticha bimaculalis, Snell. Celebes.

Anydraula xanthobathra, sp. n.

♀. 14 mm. Forewings whitish ; a basal spot and inwardly oblique fascia beyond it deep ochreous-yellow, fuscous-edged, on costa suffused with fuscous ; median area densely irrorated with blackish, on costa suffused with fuscous ; three posterior deep ochreous-yellow fuscous-edged fasciæ (third hindmarginal) converging from costa to anal angle, where they form a blotch containing a metallic grey spot, lower half of space between second and third shining grey ; hindmargin sinuate above anal angle, sinuation more marked in dark basal portion of cilia. Hindwings whitish ; an ochreous-yellow fuscous-edged fascia about $\frac{1}{3}$, connected below middle by a slender metallic-edged streak with anal angle ; median area irrorated with blackish, limited posteriorly

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by a double blackish line; four large irregular black hindmarginal spots, separated by narrow ochreous-yellow marks, and containing pale bluish-golden-metallic dots.

Pulo Laut; one specimen. Near the Indian *A. junctalis*, Hamps., but the yellow basal spot of forewings is a sufficient distinction.

Cataclysta nyctopis, sp. n.

♀. 14 mm. Forewings rather dark fuscous; first line and costal portion of second suffusedly darker; dull brownish-orange subterminal and hindmarginal streaks from costa reaching half across wing, lower extremities separated by a shining prismatic-grey spot; a brownish-orange hindmarginal mark above anal angle, preceded by a metallic-grey spot. Hindwings with 5 and 8 present; rather dark fuscous; a whitish dark-edged sinuate transverse discal mark; second line obscurely whitish, edged with dark fuscous; an irregular black hindmarginal fascia, not reaching margins, obscurely edged with ochreous-whitish anteriorly, and containing five ill-defined bluish-leaden-metallic spots.

S.E. Borneo; one specimen.

Schoenobius punctellus, Z. Pulo Laut, S.E. Borneo.

S. celidias, sp. n.

♂. 20—27 mm. Antennal ciliations 1. Forewings elongate-triangular, hindmargin bowed, oblique; brown; a longitudinal darker suffusion above middle of disc; three dark fuscous dots on fold, towards base and before and beyond middle; a fourth in disc beyond middle; an ill-defined irregular dark fuscous line from costa before apex to third dot on fold. Hindwings white at base, changing gradually to light brown at apex.

S.E. Borneo; two specimens.

Scirpophaga mnesidora, sp. n.

♂. 24 mm. Labial palpi very long. Abdomen with a yellow-ochreous subbasal band. Forewings with hindmargin nearly straight, rather strongly oblique; white; a deep yellow costal streak from base to apex, enclosing some metallic and blackish scales towards base, elsewhere indistinctly margined with dark fuscous beneath; lines dark metallic-fuscous, first somewhat inwards-curved, preceded by a short projection from costal streak, second from beyond $\frac{3}{4}$ of costa to near anal angle, thence sharply bent to middle of disc, and again angulated to $\frac{3}{5}$ of inner

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margin; a triangular projection from middle of costal streak, edged with dark fuscous, touching angle of second line; anal space enclosed by second line ochreous-yellow; a metallic-grey hindmarginal streak, partly edged anteriorly with dark fuscous; cilia deep yellow, tips whitish. Hindwings white.

Sambawa; one specimen. Although so differently marked from an ordinary *Scirpophaga*, there is no difference of structure except that the palpi are longer than usual.

PYRALIDIDÆ.

Endotricha decessalis, Walk. Sambawa.

E. orthotis, sp. n.

♂. 15—17 mm. Forewings with hindmargin straight, oblique; 4 and 5 stalked; yellowish-crimson, posteriorly finely black-sprinkled; first and second lines straight, parallel, blackish, first very indistinct: cilia crimson, with a black line, beyond this pale yellowish from below apex to anal angle, at apex mixed with black. Hindwings with hindmargin almost straight; colour and lines as in forewings: cilia pale yellowish, basal third crimson.

Sambawa; two specimens. Peculiarly distinguished by the straight hindmargin.

Pyralis oenoalis, Walk. (— *ealis*). S.E. Borneo.
P. fuscicostalis, Snell. S.E. Borneo.
P. manihotalis, Gn. Sambawa.

Balanotis euryptera, sp. n.

♂. 16 mm. Forewings triangular, hindmargin slightly rounded, little oblique; pale greyish-ochreous, suffused with greenish-ochreous towards base; a median series formed by a black dot on costa, three in disc, and one above inner margin; second line fuscous, indistinct, marked with a black dot on costa and about four in disc; a fuscous hindmarginal band on costa sprinkled with black. Hindwings fuscous-whitish; a pale fuscous hindmarginal fascia and faint line before it.

Sambawa; one specimen.

Crasignes, n. g.

Face rounded; ocelli present; tongue developed. Antennæ $\frac{2}{3}$, in ♂ minutely ciliated, basal joint with a small apical tubercle in front. Labial palpi moderate, porrected, second joint thickened

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with rough scales above and beneath, terminal joint very short, concealed. Maxillary palpi rather long, porrected, towards apex with rough spreading hairs. Posterior tibiæ with outer spurs as long as inner. Forewings with 3 and 4 short-stalked, 5 approximated, 7 and 8 out of 9, 10 closely approximated. Hindwings with 3 and 4 stalked, 5 approximated, 7 out of 6 near origin, anastomosing with 8 to about middle.

Somewhat nearly allied to *Trichophysetis.*

C. microspila, sp. n.

♂. 12 mm. Labial palpi deep yellow, tip blackish. Forewings elongate-triangular, costa arched, apex very obtuse, hindmargin much rounded, little oblique; ochreous-white, more ochreous posteriorly; first and second lines faintly ochreous, hardly traceable, curved-angulated, first marked on costa with a black dot, second double towards costa; a small black spot on costa at ⅔, and a black dot on hindmargin above anal angle, connected by a bent series of three indistinct blackish dots (conspicuously marked on lower surface); hindmarginal line and two lines in cilia fuscous. Hindwings ochreous-white, becoming pale brownish-ochreous posteriorly; first and second lines fine, straight, light brownish, on inner margin black; hindmarginal line and two lines in cilia fuscous.

Sambawa; one specimen.

Diplopseustis hemiophthalma, Meyr. Pulo Laut.

SICULODIDÆ.

Addæa trimeronalis, Walk. Sambawa.

A. probolopis, sp. n.

♂ ♀. 16—18 mm. Antennæ whitish-ochreous, ringed with black. Forewings with hindmargin sinuate below subacute apex, bowed, oblique; reddish-ochreous, strigulated with reddish-brown; basal half much suffused with reddish-brown, limited by an anteriorly ill-defined narrow dark reddish-fuscous fascia somewhat beyond middle, parallel to hindmargin, but rather angularly projecting in middle, becoming obsolete towards inner margin; costa with blackish scales and whitish dots; a narrow brownish hindmarginal suffusion. Hindwings with hindmargin nearly straight; reddish-ochreous, strigulated with reddish-fuscous; a slightly darker median fascia; a reddish-ochreous-brown suffused hindmarginal fascia, strigulated with dark fuscous.

Pulo Laut, S.E. Borneo; three specimens.

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A. syndesma, sp. n.

♀. 15 mm. Forewings with apex rectangular, hindmargin bowed, oblique; whitish-ochreous; costal edge black, interrupted with whitish; an elongate-triangular brown patch, its base extending along anterior half of inner margin, its apex resting on apical extremity of costa, including a blackish discal dot; brown subterminal and hindmarginal streaks, confluent above middle and not reaching apex. Hindwings with hindmargin nearly straight; whitish-ochreous; five brownish dark-edged straight parallel transverse streaks; a fuscous submarginal stria.

Pulo Laut; one specimen.

Siculodes emblicalis, Moore. Pulo Laut.

S. micacealis, Walk. Pulo Laut, Celebes.

S. ancylosema, sp. n.

♂. 22 mm. Forewings with hindmargin bowed, oblique; pale brownish, indistinctly strigulated with darker brown; about seven round white costal spots, containing some fuscous scales, costal interspaces dotted with black; four pairs of whitish transverse striæ connected with costal spots, posteriorly only distinct towards inner margin; between second and third a dark brown median fascia, not reaching costa, its upper extremity forming a triangular projection posteriorly; a semicircular white mark below apex, beneath which is a dark brown spot. Hindwings with hindmargin irregularly bowed; brownish-whitish, strigulated with brown; a straight dark brown fascia before middle; some dark brown marks towards anal angle; a brownish transverse fascia before upper half of hindmargin.

Pulo Laut; two specimens.

S. subrosealis, Leech. Pulo Laut.

S. imbutalis, Walk. Pulo Laut.

S. chalcosidera, sp. n.

♂. 21—23 mm. Anal prensors very long and densely haired. Forewings with hindmargin bowed, rather strongly oblique; deep coppery-brown, strigulated with dark fuscous, more or less suffused with whitish in disc and towards costa; indications of about eight slender darker fasciæ, one in middle broader and conspicuous on upper half; subterminal and marginal series of metallic-grey spots, and some others towards inner margin. Hindwings with hindmargin rounded; coppery-brown, with dark fuscous strigulæ; numerous scattered metallic-grey spots; a suffused costally-broad median, and narrower hindmarginal fascia dark fuscous.

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S. platyntis, sp. n.

♀. 15 mm. Thorax with unusually broad scales. Forewings broad-triangular, hindmargin rounded, rather oblique; brown, strigulated with dark fuscous; a basal patch, partly obsolete towards costa, an irregular median fascia, and a hindmarginal fascia dark purplish-fuscous. Hindwings with hindmargin rounded; brown, strigulated with dark fuscous; subbasal, median, and hindmarginal fasciæ dark purplish-fuscous.

Pulo Laut; one specimen.

S. pudicula, Gn. Pulo Laut, S.E. Borneo.

S. argentalis, Walk. Sambawa, Pulo Laut. The conspicuous dark blotch of the forewings is not nearly so broad in the Sambawa form.

S. mochlias, sp. n.

♂ ♀. 18—22 mm. Forewings with hindmargin rounded; shining white, with scattered dark fuscous strigulæ; costal edge black, marked with white dots; anterior half of costa suffused with fuscous; a dark-fuscous narrow transverse mark beyond middle of inner margin, reaching $\frac{1}{3}$ across wing; three black subterminal dots below apex. Hindwings with hindmargin rounded; shining white, with scattered dark-fuscous strigulæ; a subterminal series of black dots, sometimes obsolete except near apex.

Pulo Laut; two specimens.

S. anticalis, Walk. Pulo Laut.

S. bastialis, Walk. (?) Pulo Laut; one rather doubtful specimen.

PHYCITIDÆ.

Myelois pulchra, Butl. Sambawa.

Salebria apotomella, Meyr. Pulo Laut.

Ephestia desuetella, Walk. Sambawa.

GALLERIADÆ.

Prasinoxena, n. g.

Antennæ with basal joint swollen, in ♂ above with broad concave horny projection, forming an eye-cap. Labial palpi in ♂ short, curved, in ♀ moderately long, porrected. Forewings with 7 and 8 out of 9, 10 absent. Hindwings in ♂ with inner margin narrowly

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folded beneath, enclosing a hair-pencil ; 3 and 4 stalked or coincident, 5 absent, 7 out of 6 near origin, anastomosing with 8 to beyond middle.

A curious genus; the specimens are rather imperfect, hence the above description is not full, but I think sufficient. Type *P. monospila.*

P. monospila, sp. n.

♂ ♀. 15—16 mm. Forewings elongate-triangular, costa arched, hindmargin slightly rounded, oblique; bright green ; a fuscous or dark fuscous dot in middle of disc : cilia light brown, spotted with blackish. Hindwings pale ochreous-yellowish.

S.E. Borneo ; two specimens.

P. hemisema, sp. n.

♀. 18 mm. Forewings more elongate than in *P. monospila,* costa less arched, hindmargin more oblique : bright green ; a fuscous, almost interrupted bar from inner margin before middle, reaching half across wing : cilia yellow-brownish, spotted indistinctly with blackish. Hindwings white.

Sambawa ; one specimen.

CRAMBIDÆ.

Crambus malacellus, Dup. Sambawa.

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XIX. *Supplemental List of the Longicorn* Coleoptera *obtained by* Mr. J. J. Walker, R.N., F.L.S., *during the voyage of H.M.S. "Penguin," under the command of* Captain Moore, R.N.

By Charles J. Gahan, M.A., F.E.S.

[Read May 2nd, 1894.]

The Longicornia collected by Mr. Walker in Australia and Tasmania are enumerated in a list which was published in the Transactions of this Society for 1893. In order to complete the account of the beetles of this family which were obtained by Mr. Walker during the recent voyage of H.M.S. "Penguin," I now give a list of the species taken at the other localities which were visited. A few species, taken at Damma Island, are, however, omitted from the list, and will be described in a separate paper. Full references are only given for those species which have been described since the publication of the Munich Catalogue, and for one old Fabrician species which has been omitted from that work. Three species are described as new.

Prionidæ.

1. *Eurypoda antennata*, Saund.

One example; taken at Nimrod Sound, Chusan Archipelago.

2. *Ægosoma marginale*, Fabr.

Hong Kong and Kowloon (S. B. T. Skertchley); two examples.

3. *Ægosoma sinicum*, White.

Shanghai; two specimens.

4. *Philus antennatus*, Gyll.

Hong Kong; three examples.

Cerambycidæ.

5. *Xystrocera globosa*, Oliv.

Shanghai; one example. Haining; one example.

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6. *Cerambyx cantori,* Hope.

Shanghai; one example.

7. *Æolesthes aurifaber,* White.

Silam in North Borneo (Skertchley); one example.

8. *Æolesthes sinensis,* Gahan, Ann. and Mag. Nat. Hist., ser. 6, vol. vi., p. 255 (1890).

Hong Kong; one example.

9. *Rhytidodera bowringi,* White.

Hong Kong; one example.

10. *Gnatholea subnuda,* Lacord.

Silam, N. Borneo (Skertchley); one example.

11. *Ceresium raripilum,* Newm.

Silam, N. Borneo (Skertchley); one example.

12. *Ceresium simplex,* Gyll.

Koepang, Timor; one example.

13. *Pyresthes hæmatica,* Pasc.

Hong Kong; two examples.

14. *Erythrus fortunei,* White.

Luhwang I., Chusan Archipelago; one example.

15. *Aromia bungii,* Fald.

Shanghai; one example.

16. *Polyzonus bicinctus,* Pall.

Nimrod Sound, Chusan Archipelago; six examples.

17. *Clytus chinensis,* Chevr.

Shanghai; one example.

18. *Clytanthus signaticollis,* L. and G.

Chusan Island; one example.

19. *Dere thoracica,* White.

Tamason Island, Chusan Archipelago.

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20. *Sternoplistes temmincki*, Guér.

One example; taken on the mainland opposite Tygosan Island, Chusan Archipelago.

LAMIIDÆ.

21. *Dorcadida bilocularis*, White.

Tasmania. This species was accidentally omitted from the first list.

22. *Epepeotes plorator*, Newm.

Koepang, Timor; one female example.

23. *Psacothea hilaris*, Pasc.

Haining.

24. *Monohammus tesserula*, White.

Shanghai, and Luhwang Island, Chusan Archipelago.

25. *Monohammus luridus*, Pasc.

Mainland opposite Tygosan Island, Chusan Archipelago.

26. *Cyriocrates horsfieldi*, Hope.

Chusan Island.

27. *Melanauster chinensis*, Forst.

Hong Kong, Shanghai, and Pwanche Island, Chusan Archipelago.

28. *Melanauster glabripennis*, Motsch.

Haining; one example.

29. *Aristobia hispida*, Saund.

Tygosan Island, Chusan Archipelago.

30. *Blepephaeus succinctor*, Chevr.

Hong Kong.

31. *Xenolea tomentosa*, Pasc.

Samboangan.

32. *Xenolea tomentosa*, Pasc., var.

Hong Kong. The subglabrous patches on the elytra are blackish in colour.

33. *Batocera lineolata*, Chevr.

Shanghai.

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34. *Batocera davidis*, Deyr., Ann. Soc. Ent. Fr., 1878, p. 131.

Pwanche Island, Chusan Archipelago; two examples (♂ and ♀). This species has previously been recorded only from the interior of China.

35. *Batocera thomsoni*, Javet, var.

Silam, N. Borneo (Skertchley). In the single example taken there is only one spot on each elytron, but it does not seem to be otherwise distinct from *B. thomsoni*.

36. *Apriona rugicollis*, Chevr.

Chinhae.

37. *Rosenbergia megalocephala*, v. de Poll, Notes from the Leyden Museum, viii., p. 32, pl. 1, figs. 5 and 5a (♀). Id., vol. ix., p. 184 (♂).

Port Darwin, North Australia; one example.

38. *Himantocera plumosa*, Oliv.

Silam, N. Borneo (Skertchley).

39. *Gnoma propinqua*, Pasc.

Ternate, Malay Archipelago; ♂ and ♀ examples.

40. *Coptops auguralis*, Pasc.

Damma Island, Malay Archipelago; one example.

41. *Olenecamptus bilobus*, Fabr.

Damma Island and Hong Kong.

42. *Gerania boscii*, Fabr.

Koepang, Timor.

43. *Hestima floccosa*, Pasc.

Ternate.

44. *Pterolophia illicita*, Pasc.

Ternate; one example.

45. *Pterolophia costalis*, Pasc.

Ternate.

46. *Pterolophia obducta*, Pasc.

Koepang in Timor.

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47. *Pterolophia*, sp.

Manila (J. Green); one example.

48. *Pterolophia rigida*, Bates.

China, the mainland opposite Tygosan Island; one example.

49. *Ropica squamosa*, sp. n.

Samboangan.

50. *Ropica*, sp.

Samboangan.

51. *Ropica indigna*, Pasc.

Ternate.

52. *Sybra umbratica*, Pasc.

Ternate.

53. *Tetraglenes insignis*, Newm.

Chusan Island.

54. *Exocentrus*, sp.

Shanghai; one example.

55. *Agapanthia amurensis*, Kraatz, Deutsche Ent. Zeit. xxiii. (1879), p. 115.

Shanghai.

56. *Glenea elegans*, Oliv.

Amboyna.

57. *Glenea melia*, Pasc.

Silam, N. Borneo (Skertchley).

58. *Glenea fortunei*, Saund.

Tamaon Island, Chusan Archipelago.

59. *Glenea cantor*, Fabr.

Lamia cantor, Fabr., Mant. Insect., vol. i., p. 142.

Hong Kong (Skertchley).

60. *Phytœcia ventralis*, Bates.

Tamaon Island, Chusan Archipelago.

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61. *Oberea nigriceps*, White.

Hong Kong.

62. *Oberea inclusa*, Pasc.

Tygosan Island.

63. *Oberea walkeri*, sp. n.

Hong Kong.

64. *Linda fraterna*, Chevr.

sub *Hemilophus fraternus*, Chevr., in Cat. Gemminger and Harold. = *Oberea seminigra*, Fairm., Ann. Soc. Ent. Belge, 1887, p. 134.

Tygosan Island, Chusan Archipelago.

65. *Chreonoma basalis*, sp. n.

Hong Kong; one example.

Ropica squamosa, sp. n.

Squamositate fulva et grisea induta; capite prothoraceque minute haud dense punctatis, hoc lateraliter paullo rotundato; elytris dense sat fortiterque punctatis, utrisque postice lineolis duabus fuscis et maculis minutis albis duabus vel tribus signatis; antennis quam corpore fere sesqui-longioribus, articulo 1° punctato, fulvescente-pubescente, ceteris fuscis, cinereo-maculatis. Long. 5½—7 mm.

Hab. Samboangan.

Dark brown, clothed with minute scales, which are, for the most part, fulvous-brown in colour, but are of a greyish tint along the sutural area on the anterior half of the elytra. The head and prothorax are minutely and rather sparsely punctured. The elytra are thickly and more strongly punctured, with the punctures partly arranged in longitudinal rows, and each bearing a minute white seta stretched across its opening. Some whitish scales are aggregated to form two or three small spots a little beyond the middle of each elytron, and from these spots there pass backwards two very short dark-brown lines. Minute dark-brown spots appear at intervals along the suture and on other parts of the elytra.

Ropica didyma, Pasc., seems to approach the present species most nearly in general shape and colour; but its covering is of a different character, being in the nature

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of short hairs, as in the majority of the species of the genus, and not in the form of minute flattened scales, as in the present species and in *R. servilis*, Pasc.

Oberea walkeri, sp. n.

Fulva ; capite, antennis, elytris pygidioque nigris ; tibiis apice, tarsisque et (in mare) segmentis intermediis abdominis infuscatis : capite distincte sat denseque punctato ; prothorace quam longiori evidenter latiori, dense punctato, lateraliter medio obtuse rotundato ; elytris fortiter denseque et seriatim punctatis, per medium fusco-testaceo-dilutis, griseo tenuiter pubescentibus, area minima circum scutellum et macula sub humerum testaceis. Long. 16—19 mm.

Hab. Hong Kong (J. J. Walker).

Head, antennæ, elytra, and pigidium black ; thorax and underside of body fulvous, with the sides of the three intermediate abdominal segments slightly infuscate in the male ; tarsi and distal portion of tibiæ blackish. Head distinctly punctured, with the punctures more thickly spread on the vertex than in front. Prothorax distinctly broader than long, thickly punctured ; slightly gibbous in the middle above, a little bulged out on each side, reaching its greatest width just behind the middle. Elytra strongly punctured, with the punctures arranged in closely approximated rows; a slight testaceous tint appears along the middle of each elytron, and there is a distinct, but very small testaceous space around the scutellum ; a faint greyish pubescence covers almost the whole of the dorsal surface ; the apices are each slightly emarginate, and feebly dentate at each of the four angles. The sides of the breast are strongly but very sparsely punctured.

The last ventral segment, black, with the exception of a narrow anterior border, bears in the male a rather broad longitudinal channel which narrows anteriorly ; in the female this segment has near the apex a narrow triangular depression, which is continued anteriorly as an impressed line. The male is further distinguished by its slightly longer antennæ, and by having the front of its head narrower, and covered with a more distinct greyish pubescence.

Appears to be most nearly allied to *O. japonica*, Bates.

Chreonoma basalis, sp. n.

Fulvo-testacea, elytris (limbo basali excepto) violaceis aut cyaneis ; capite sparsim punctato, medio frontis in mare breviter sed prominente carinato : prothorace sat dense punctato, supra convexo, lateraliter medio rotundato ; elytris sat dense punctatis ;

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antennis articulis 4—6 ultimis nigro-fuscis. Long. 10—11. Lat. 3½—4 mm (♂ ♀).

Hab. Hong Kong (J. J. Walker and J. C. Bowring).

Fulvous; the elytra violet or deep blue, with a very narrow fulvous band at the extreme base reaching from the scutellum to the outer margin. Antennæ with the last four to six joints blackish; those of the male about as long as the body, those of the female somewhat shorter.

The front of the head in the male bears in the middle a short tuberculiform carina. In this and other characters the species seems to come nearest to *C. frontalis*, Gahan.

Glenea cantor, Fab.

Lamia cantor, Fab., Mant. Ins., vol. i., p. 142.

Hab. Hong Kong (Skertchley), and China (? Hong Kong) (Bowring).

This species is omitted from the Catalogue of Gemminger and Harold. It is nearly allied to *Glenea spilota*, Thoms., from which it may be distinguished by the following characters:—

The elytra are usually of a pale yellowish colour, only exceptionally offering a slight pinkish tint. The shoulders are pitchy-black, slightly margined behind with red. The foremost of the two black spots placed near the apex of each elytron extends in an almost directly transverse direction from the outer margin to near the suture. In *spilota* there are two spots (sometimes united) occupying a similar position, but placed more obliquely. In *G. cantor* the entire hind legs and the tarsi of the two anterior pairs are blackish in colour.

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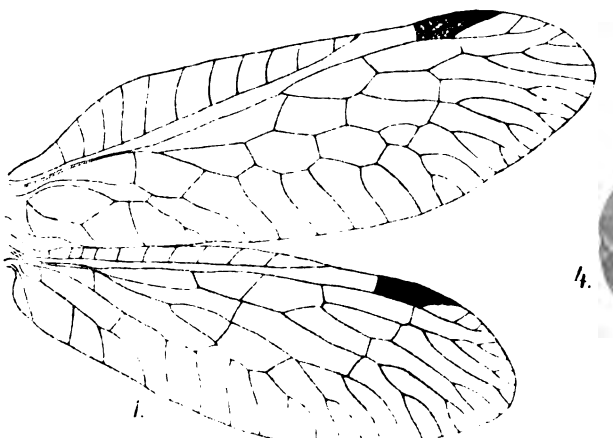

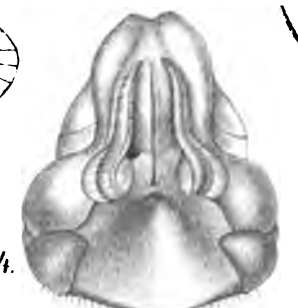

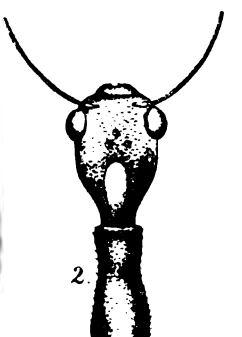

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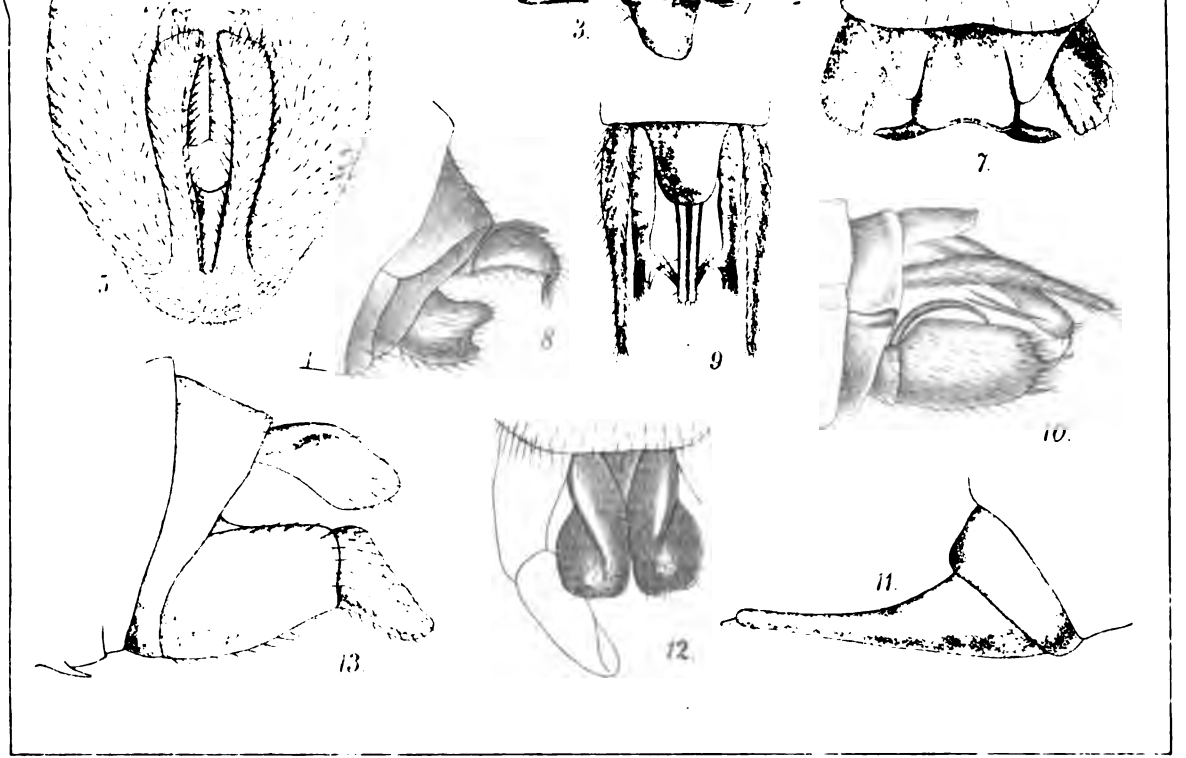

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XX. *Descriptions of a new species of* Raphidia, L., *and of three new species of* Trichoptera *from the* Balkan Peninsula, *with critical remarks on* Panorpa gibberosa, McLach. By Professor Franz Klapálek, F.E.S.

[Read June 6th, 1894.]

Plate X.

In the second half of July and the first half of August, 1893, I made a journey in Bulgaria and East Roumelia, the results of which are published in the Magazine for Art and Science, edited by the Bulgarian Ministerium for Cultus and Education. To make the descriptions of the new species also accessible to Non-Slavic Naturalists, I have the permission of the editors of that magazine to publish them simultaneously in a foreign periodical, and having the honour to be a member of the Entomological Society of London, I take the liberty to present the English text.

Raphidia rhodopica, n. sp.

Head black, oval, narrowed gradually to the collum, deeply punctate, the punctures having an appearance of transversal ridges. Front black, shining. Ocelli distinct. Antennæ at the base testaceous, darker to the apex, which is wholly black. The smooth median longitudinal space on the collum and occiput black, with a distinct longitudinal impressed line. Labrum fuscous, testaceous on the margins. Mandibulæ testaceous, blackish at the tips. Palpi maxillares fuscous, galeæ testaceous. Labium fuscous, with exception of two very distinct yellow, triangular spots. Palpi labiales shining black. The underside of the head black, more sparingly punctured than above, with a longitudinal groove in the middle, which becomes broader towards the mouth. Collum moderately long, a little narrower behind.

Prothorax $\frac{1}{5}$th shorter than the head and collum, narrowed in the first third, broader behind. Pronotum punctured, and transversely rugose, with short pubescence, black, the anterior edge narrowly yellowish and the hind angles yellow. Mesothorax black, on the notum anteriorly with a distinct rhombic yellow spot; on the sides

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before the base of the wings is a small oblong yellow spot; the scutellum has in the middle a yellow point, hinder edge narrowly reddish-brown.

Coxæ and trochanters black; on the anterior and middle femora the base and outside, except a short space on the apex, is black, the innerside, except the base and the apex, yellowish-brown. Posterior femora with exception of the yellowish-brown apex black. Tibiæ yellowish-brown, tarsi yellowish-brown, fuscescent at the apex. Abdomen shining black, with a narrow yellow lateral line; the intermediate segments narrowly margined with yellow posteriorly at the sides, and on the middle of the posterior margin beneath. The 7th abdominal segment short, the 8th divided into a dorsal and ventral valve; the first of them is longer than the foregoing segment, quadrangular if viewed from the side, under the thickened side margins swollen on either side into a shining black smooth hemispheric lobe; the ventral valve, directed downward, has the apical margin notched, thickened and fuscous.

On the innerside of this valve lie two testaceous crotchets directed against the apical margin and slightly curved inwardly. Under these crotchets lies the penis, which is canaliculated beneath. The 9th segment is widely opened and slightly notched on the hindmargin, which is yellow; the hinder angles strongly thickened and beset with black spines.

Anterior wings three times as long as broad, with elliptical apex, pellucid. Two cells along the radius from the origin of the sector and three discoidal cells. Costal area dilated in the first third, with 11-12 simple veinlets. Subcosta joins the costa at a distance from pterostigma equal to two-thirds of its anterior margin. Pterostigma trapezoid, dark-brown, with a single simple veinlet parallel with its outer margin; its inferior margin scarcely half the length of the superior. First discoidal cell begins at the same distance before the pterostigma as is the termination of the subcosta, and extends very little beyond its hindmargin. Four cubital cells. First apical vein simply furcated; the second thrice furcated; the third divided into two branches; the fourth furcated twice; and the two next following are divided into three branches.

Posterior wings in the costal area with 8-10 transverse veinlets. Cubitus with one branch anteriorly, and in the area between the sector radii and the anterior branch of cubitus there is only one transverse veinlet.

♀ unknown.

Exp. 23·5-25 mm., long. 11·5 mm.

By the structure of wings *R. rhodopica* is near to *R.*

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schneideri, Ratzb. and *R. sericea*, Albarda, from which it differs by the dark brown pterostigma, by the relative length of the first discoidal cell, and by the form of the genital parts. These are similar to those of *R. major*, Burm., from which it differs by the single cross veinlet in the pterostigma and by four cubital cells.

I collected two ♂ on bushes along the road from Philipopol to the monastery Bela Cerkva, 30th July.

Polycentropus excisus, n. sp.

Similar to *P. flavomaculatus*, Pict., in general appearance, but the antennæ are yellow, the apex only annulated indistinctly with brownish. Palpi and legs yellow, and the markings on the anterior wings are pale yellow; the footstalk of the apical fork No. 3 is at least half so long as the fork.

In the ♂ the dorsal plate is almost quadrangular, slightly excised on the apex. Superior appendages a little longer than the dorsal plate, broad. Viewed from the side their upper margin is rounded and the lower almost straight. From above they are quadrangular, with rounded exterior apical angle. Their base is covered above by a large triangular lobe joined to the base of the dorsal plate. Intermediate appendages short, reddish-brown, escaping from beneath the apical angles of the dorsal plate, curved down, but their tip turned again upward. Inferior appendages a little shorter than the superior, concave inwardly and convex outwardly with deeply excised apical margin. Both the upper and lower edge are so far turned inwardly that they touch each other, forming, in this way, a tube opened at the apex.

♂ unknown.

Exp. 15 mm., length 5 mm.

I would not have dared to describe this species from the single ♂ collected in Bojana, near Sophia, 20th July, had not the form of the appendages been so very characteristic.

Tinodes unidentata, n. sp.

Body black, clothing black mingled sparingly with testaceous. Antennæ fuscous, very indistinctly and narrowly annulated. Legs brown or fuscous, trochanters and knees testaceous. Anterior wings blackish, sparingly covered with black pubescence. Neuration distinct, similar to that of *T. dives*, Pict.; posterior wings similar in colour to the anterior, not iridescent. Fringes blackish grey.

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In the ♂ the dorsal plate from side is elongate, slightly convex above at the base, with parallel upper and lower margins, the lower being obliquely arched upward at the apex. Superior appendages $2\frac{2}{3}$ as long as the dorsal plate, slender, slightly dilated towards the base, slightly curved downward and covered with blackish hairs. Intermediate appendages curved downward, bearing on the apex short thin spines and furnished on the underside before the apex with few slender long backward spines and with a feeble spine arising from the underside and curved downward, but with the apex again turned upward in form of the letter S. Inferior appendages two-jointed, 1st joint short, quadrangular, the 2nd much broader, elongately quadrangular, bearing on the middle of the apical edge a strong upwardly curved tooth. The exterior of these appendices, except the dorsal and apical margin of the second joint, is covered with black fine hairs, the apex of the second joint is furnished with dense straight strong setæ, which almost conceal the apical tooth. Between the base of these appendages arises the shining, reddish-brown, spiniform penis, which is arcuate and with its apex turned downward between the appendices. The colour of all appendices in specimens preserved in alcohol is testaceous except the basal half of the inferior appendages, which is fuscous; in dry specimens the colour is fuscous, the apex of inferior appendages only being shining testaceous.

♀ similar to that of *T. dives*, Pict. Exp. ♂ 9·5—11 mm.; ♀ 11—12 mm.

This species, most resembling *T. dives*, Pict., is easily distinguishable by the uniform blackish wings, the slender superior appendages, the simple spiniform penis and the single tooth on the apical edge of the inferior appendages of the ♂.

Frequents the rapid streams on the slopes of the Vitosă Mountain near Sophia, Bojana, 20th July.

Rhyacophila obtusa, n. sp.

Fuscous, head and pronotum clothed with golden yellow hairs. Antennæ uniformly fuscous, with dense short pubescence. Palpi fuscous. In the legs the coxæ are fuscous, the rest testaceous, tarsi fuscescent to the apex; spurs brown and therefore very distinct. Wings short and broad, anterior with an almost semicircular apex. Membrane smoky-grey, uniformly densely covered with golden-brown pubescence, mingled only very sparingly with blackish hairs; on the posterior the pubescence is thinner and

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black. Pterostigma of all four wings distinct greenish brown. Neuration distinct, dark brown; radius not furcated before the apex; second apical fork extending only very little further inwardly than No. 1; costal margin of the anterior wings furnished, at its base only, with plumose hairs amongst the simple. Fringes dark grey.

In the ♂ the 9th abdominal segment on the dorsal and ventral side distinctly developed, though its ventral part is considerably narrower. The external lobes are very large, reaching to the middle of the inferior appendages, viewed from side rhomboid, with the lower part bent round outwardly. If viewed from above, the external margin appears to form a raised arcuate edge disappearing at the apex and forming an axis round which the lower part of the lobe is bent outwardly. Both lobes are united at the base, but separated for more than the apical half of their length; they are sparingly furnished with stiff hairs. First joint of the inferior appendages oblong, convex on its lower edge; second joint much shorter, very obliquely truncate at the apex, so that the upper edge is much shorter than the lower, which is concave at the base, convex at the considerably produced apex; the apical edge straight. Lower penis-cover not exserted, large, boat-shaped, fuscous, and slightly excised at the apex. Exp. 16 mm., length 5·5 mm.

♀ unknown.

Three ♂ at a brook in Dragalevci flowing from the Vitosă Mountains near Sophia, 22nd July.

When living this species has the appearance of a pale *Silo* or *Lithax*, and was found sitting on the underside of leaves of plants on the bank. Though its radius is not divided at the apex, we must put it into the *Section C.* of the genus *Rhyacophila* (McLach., Rev. and Syn., p. 158), from its short and broad wings and the form of the anal appendices. Though the external lobes appear very similar to those of *Rh. eatoni*, McLach., the lower penis-cover and the uniform colour of the wings show its relation to the group of *Rh. lævis*, Pict., from which it differs especially in the form of the external lobes and by the presence of the plumose hairs on the costal margin of the anterior wings.

Panorpa gibberosa, McLach.

This highly interesting species was described by Mr. McLachlan in his Synopsis of the species of Panorpa occurring in Europe and the adjoining countries (Trans.

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Ent. Soc. 1869, Part I.) from one ♂ and ♀; but since that time, as the author has kindly informed me, it has not been seen by him. I hope, therefore, it will not be out of place to give some critical remarks on it, as I have been so fortunate as to collect a series of specimens in two separate localities in Bulgaria and Eastern Roumelia. The most important characters in which this species differs from *P. germanica*, L., to which it is very nearly allied, are in the furca ("appendices segmenti 9," McLach.), whose branches are longer and have their apex obliquely truncate and in the larger process of the third dorsal segment. The wing markings are similar to those of *P. germanica*, var. *apicalis*, St. Two of my specimens are quite typical, agreeing with the description and figures in all but in the dorsal process of the 3rd abdominal segment, which does not appear larger than in *germanica*. From this species they differ, besides the other characters named above, by the shining black occiput, the brown colour which covers regularly the whole occiput in *P. germanica* is limited to the hinder eye margins. Abdominal segments 7th and 8th marked on either side by a large black shining spot; furca fuscous, almost black at the apex, with dense strong black setæ; on the rostrum are two very distinct shining black lines. Another specimen agrees in all respects with the first two, but the pterostigma is only yellowish without the usual dark-brown spot, instead of which it has a little point at the base of the sector and two similar below the pterostigma. Two other specimens agree with the last, but have in the pterostigma a dark brown spot, which is smaller than in typical examples. A series of specimens are in the markings similar to *P. germanica*, but the anal parts are those of *gibberosa*. One most aberrant example is smaller, very dark, having the 7th and 8th abdominal segments wholly shining black; the wings are transparent, very shining, with a slight greenish and brownish tinge; the spots are conspicuous, and, besides the above-named, we find two dark brown points below the middle of the anterior margin of the wings. A series of ♀ show no difference from those of *P. germanica* collected on the mountains of the Bohemian frontier. They are very dark, and with conspicuously marked wings. I do not hesitate to identify these examples, at least the first named five, with *P. gibberosa*, McLach., and I am inclined to

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hold this species distinct from *P. germanica*, but to have absolute certainty, we must wait for more materials; it would be especially desirable to ascertain whether the typical *P. germanica* occurs in those regions; the season when I visited them was rather advanced. The difference between *P. germanica* and *gibberosa* is indeed very slight, but yet greater than between *P. communis*, L., and *P. vulgaris*, Imhoff, which, after all, are only two forms of one species.

Explanation of Plate X.

Figs. 1—4. *Raphidia rhodopica*, n. sp. 1. Wings. 2. Head. 3. Apex of the ♂ abdomen from side. 4. The same from behind.

Figs. 5 & 6. *Panorpa gibberosa*, McLach. 5. Terminal segments beneath. 6. Apex of abdomen from side.

Figs. 7 & 8. *Polycentropus excisus*, n. sp. 7. Apex of the abdomen of ♂ from above. 8. The same from side.

Fig. 11. *Tinodes unidentata*, n. sp. 9. Apex of abdomen of the ♂ from above. 10. The same from side. 11. Apex of abdomen of the ♀.

Figs. 12 & 13. *Rhyacophila obtusa*, n. sp. Apex of abdomen of the ♂. 12. From above. 13. From below.

[Figs. 1, 2, enlarged $\frac{6}{1}$; Figs. 3, 4, $\frac{12}{1}$; Fig. 5, $\frac{18}{1}$; Fig. 6, $\frac{2}{1}$; Figs. 7, 9, 10, $\frac{15}{1}$; Figs. 8, 11, 12, and 13, $\frac{40}{1}$. All drawn with camera lucida.]

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XXI. *A Monograph of British* Braconidæ. Part V. By the Rev. Thomas A. Marshall, M.A., F.E.S., and Member of the Société Entomologique de France.

[Read March 28th, 1894]

Plates XI. and XII.

V. EXODONTES.

XXIV. ALYSIIDES.

Head large, with dilated cheeks; occiput concave, not margined. Mandibles broad, flattened, tridentate, or quadridentate, usually wide open after death, and often carried in that position by the living insect, even in repose; they project on each side of the head when inspected from above. Antennæ multiarticulate, often very long. Maxillary palpi generally with 6, labial with 3, joints, but the number is variable. Thorax oval, convex; prothorax short; furrows of the mesonotum usually inchoate, denoted by two humeral impressions; often obsolete; less frequently complete. Three cubital areolets in the forewings, the first sometimes confounded with the second, or with the first discoidal; stigma variable in form, oval or subtriangular, more or less elongate and linear, or disappearing altogether in the genus *Aspilota*, where it is confounded with the metacarp; posterior wings often furnished with a pobrachial transverse nervure. Both sexes are apterous in the genus *Chasmodon*; the ♀ of *Panerema* has rudimentary wings, the ♂ is unknown; in *Allœa* the wings of the ♂ are very short and narrow, with all the nervures and areolets contracted; those of the ♀ are generally, but not always, complete. Abdomen sessile, subsessile, or subpetiolate, longer than the thorax, more or less depressed, seldom compressed, as in *Panerema*, *Mesocrina*, and *Aspilota*; 1st segment rugulose, the rest almost always smooth (except *Trachyusa*); suturiform articulation effaced, or barely visible; segments 2–3 taken together longer than all the following. Terebra exserted, of variable length, short, and almost concealed only in *Adelura*.

The above characters are equally applicable to the next tribe, *Dacnusides*, except that these have only two

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cubital areolets in the forewings, thus standing in the relation of secondary forms, like *Apanteles* as compared with *Microgaster*. The analogy of the two tribes is so close that their separation, as divisions of equal value to that of preceding tribes, is merely a matter of taste. The older writers down to and including Haliday, regarded *Dacnusa* as a subsection of *Alysia*. The latter genus was first distinguished by Latreille in 1805, having for its type *A. stercoraria*, Latr., previously named *Ichneumon manducator* by Panzer. Only two subsequent authors have attempted to describe the numerous allied species; Nees v. Esenbeck published 41 in six sections, and his monograph was greatly extended and improved by Haliday in the fifth volume of the "Entomological Magazine," and in a separate tract entitled, "Alysia, Fasciculus alter," published in 1839, and containing the *Dacnusidæ*. Haliday's memoirs are so exhaustive, as far as relates to Great Britain and Ireland, that very few fresh discoveries have since been made, and his descriptions render most of the insects unmistakable. On the Continent nothing has appeared since the date of Nees v. Esenbeck's work, 1834, except a few scattered notices, and Förster's "Synopsis of Genera." This last work is valuable as giving names to all the sections pointed out by Haliday, which have now become genera, in accordance with the modern conception of the term genus. But Förster's peculiar penchant for multiplying genera, carried him, as usual, too far, and many of his divisions, especially those adapted for one species only, may be conveniently suppressed. The writings of Wesmael, which have contributed so much to the subject of the present series of papers, unfortunately stop short at the end of the *Opiides*. His collection contains two or three hundred Alysiids, which he would doubtless have published if his health had permitted; these I have seen, but as every specimen required an elaborate process of cleaning, which I had no permission to apply, with small chance of good results, I was obliged to content myself with taking a few notes.

The *Alysiides* seem to be almost exclusively parasites of Diptera, and especially of the fungivorous *Tipulidæ* and *Muscidæ*; the few observations which connect them with other orders of insects will be mentioned in their places; they are all liable to a suspicion of error.

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The determination of species is in general not difficult, owing to the obvious characters exhibited by the wing-veins; in other respects there is great uniformity. The colours are black and piceous brown, relieved in some cases with red or testaceous, and are tolerably constant in the same species. As in the case of the *Opiides*, good setting is a necessity, especially in the smaller species; the characters are mostly derived from the upper surface, but the face and the mesopleuræ should be open to examination. Pinned specimens, and all those whose wings cannot be clearly seen, are generally valueless.

Table of Genera.

(2)	1.	Both sexes wingless...	i. Chasmodon.
(1)	2.	Both sexes winged; the wings rarely rudimentary (*Panerema*), or shortened (*Allæa*).	
(4)	3.	Wings of the ♀ very short, rudimentary, almost without nervures (♂ unknown)	ii. Panerema.
(3)	4.	Wings ample, except in *Allæa*, where they are liable to be more or less shortened, the neuration always remaining complete.	
(6)	5.	Second cubital areolet confounded with the first.	xviii. Aspilota.
(5)	6.	Second cubital areolet separated from the first.	
(22)	7.	First intercubital nervure as long as, or longer than, the 2nd abscissa of the radial nervure.	
(9)	8.	First cubital areolet confounded with the 1st discoidal	iii. Syncrasis.
(8)	9.	First cubital areolet separated from the 1st discoidal	
(11)	10.	Fourth joint of the antennæ longer than the 3rd	x. Idiasta.
(10)	11.	Fourth joint of the antennæ not longer than the 3rd.	
(13)	12.	Second abdominal segment punctate, not shining, marked with a medial transverse impression	iv. Trachyusa.
(12)	13.	Second abdominal segment smooth, shining, without a transverse impression.	
(15)	14.	Metathorax longitudinally carinated in the middle; wings often more or less abbreviated ♂ ♀	v. Allœa.
(14)	15.	Metathorax not carinated; wings always fully developed.	
(17)	16.	Furrow of the mesopleuræ smooth or obsolete.	ix. Pentapleura.
(16)	17.	Furrow of the mesopleuræ crenate or rugose.	
(19)	18.	Anal nervure interstitial	vi. Cratospila.
(18)	19.	Anal nervure springing from the middle, or below the middle, of the extremity of the 2nd discoidal areolet.	
(21)	20.	Stigma short, emitting the radial nervure from beyond the middle	vii. Alysia.
(20)	21.	Stigma elongate, emitting the radial nervure before the middle	viii. Tanycarpa.
(7)	22.	First intercubital nervure shorter than the 2nd abscissa of the radial nervure (except in *Adelura dictynna*).	

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(24) 23. First cubital areolet confounded with the 1st discoidal ... ... xi. APHÆRETA.
(23) 24. First cubital areolet separated from the 1st discoidal.
(26) 25. Fourth joint of the antennæ longer than the 3rd; pobrachial areolet of the hindwings less than half as long as the præbrachial ... ... xii. PHÆNOCARPA.
(25) 26. Fourth joint of the antennæ not longer than the 3rd; pobrachial areolet of the hindwings half as long as the præbrachial, or longer.
(28) 27. Stigma obsolete, or nearly so, not distinguished from the metacarp; 2nd cubital areolet sometimes confounded with the 1st... ... ... xviii. ASPILOTA.
(27) 28. Stigma distinct, evidently stouter than the metacarp.
(32) 29. Stigma cuneiform or oval; not linear, *i.e.*, not of equal breadth throughout.
(31) 30. Stigma elongate, cuneiform, emitting the radial nervure before the middle ... ... xv. PROSAPHA.
(30) 31. Stigma oval-lanceolate, short, emitting the radial nervure from the middle... ... ... xvi. MESOCRINA.
(29) 32. Stigma linear, of equal breadth throughout.
(34) 33. Radial nervure originating at the extreme base of the stigma ... ... xiv. ANISOCYRTA.
(33) 35. Radial nervure originating at any other point of the stigma.
(36) 34. Anal nervure interstitial or nearly so; terebra very short, almost concealed ... ... xiii. ADELURA.
(35) 36. Anal nervure springing from the middle of the extremity of the 2nd discoidal areolet; terebra exserted, falcate ... ... xvii. ORTHOSTIGMA.

i. CHASMODON, *Hal.*

Hal., Ent. Mag., i., 486 (1833).

Apterous in both sexes. Head flattened; eyes minutely pubescent; maxillary palpi 6-, labial 4-jointed. Second joint of the flagellum longer than the first (as in Genus xii., *Phænocarpa*). Thorax much narrower than the head, compressed, subcylindric; sutures of the mesonotum distinct, complete, crenulate. Abdomen ♀ oval, as long as and broader than the thorax; belly compressed, obliquely truncate at the extremity; abdomen ♂ narrower, somewhat depressed. Terebra exserted.

1. *Chasmodon apterus,* Nees.

Bassus apterus, Nees, Mag. Ges. Berl., 1814, p. 207.
Alysia aptera, Nees, Mon., i., 264, ♂.
C. apterus, Hal., Ent. Mag., v., 214, ♂ ♀.

Smooth, shining; ferruginous, with the head and extremity of the abdomen blackish. Mandibles tridentate. Palpi ferruginous.

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Antennæ ferruginous, darker towards the tips, 17–21-jointed, as long as the body in the ♀, longer and more slender in the ♂. Scutellum minute, tuberculiform; mesopleuræ with a rugose furrow; metathorax punctato-rugose, subcarinate, rather darker than the rest of the thorax, truncate posteriorly. Beneath the tegulæ two small membranous lobes represent the wings. Legs ferruginous. First abdominal segment obconic, finely striolate, subcarinate at the base. Terebra straight, issuing from the lower end of the apical truncature of the abdomen, and when measured from its base, half as long as the abdomen. Length ¾–1¼ lin.

Var. ♂ deep brown, with the anterior part of the mesothorax and the base of the abdomen paler. Head black; oral parts, base of antennæ, and legs, ferruginous.

Rare; I possess but two examples. The insect has occurred in England, Ireland, and Scotland; on the Continent it has only been noticed in Germany and Holland.

ii. Panerema, *Först.*

Först., Verh. pr. Rheinl., 1862, p. 263.

Male unknown. Wings rudimentary, showing but few of the nervures. Head somewhat hemispherical; eyes bare; palpi broken, in my specimens. Second joint of the flagellum shorter than the 1st. Thorax narrower than the head, short, subcylindric, compressed; furrows of the mesonotum obsolete; the middle of its disk marked with a depression. Abdomen compressed, linear when viewed from above, longer and narrower than the thorax, almost vertically truncate at the extremity. Terebra exserted.

1. *Panerema inops*, Först. (Pl. XI., fig. 1.)

P. inops, Först., *l. c.*

♀. Black, smooth, and shining; abdomen reddish, except the first segment which is black, and the apex which is blackish. Mandibles tridentate, black; clypeus and palpi dusky. Antennæ red, each joint narrowly dusky at the extremity; rather stout, a little longer than the body, 24–25-jointed; the joints are progressively shorter from the base, and become moniliform towards the extremity. Furrow of the mesopleuræ smooth; scutellum very small, preceded by a fovea larger than itself; metathorax coarsely

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rugose, without a medial carina. Forewings as long as the metathorax, subtriangular, furnished with a stigma near the extremity, 3 nervures and 4 areolets (see Plate); hindwings nerveless, except a portion of the radial nervure visible towards the extremity. Legs red, rather stout and long. First abdominal segment nearly linear, hardly narrower at the base, deeply striate, the spiracles placed in the middle; the following segments smooth and shining; 2nd suture effaced; apical segments very short. Terebra short, falcate, ascending. Length, 1½ lin.

This species was discovered to be British by Dr. Capron, who took several specimens in a sand-pit at Shiere in Surrey: the description is made from two of these, which he kindly gave me.

iii. Syncrasis, *Först.*

Först., Verh. pr. Rheinl., 1862, p. 264.

Palpi short, the number of joints differing in the two species. First joint of the flagellum longer than the second. Metathorax carinated. Radial areolet lanceolate, not reaching the tip of the wing; radial nervure curved; 2nd abscissa shorter than the 1st intercubital nervure; 2nd cubital areolet not broader than long, measured along the cubital nervure; anal nervure interstitial.

The species are unknown to me; they are thus distinguished by Haliday:—

Maxillary palpi 4-, labial, 3-jointed	...	...	1. *fucicola*, Hal.
Maxillary palpi ?-, labial 2-jointed	...	...	2. *Halidaii*, Först.

1. *Syncrasis fucicola*, Hal.

Alysia fucicola, Hal., Ent. Mag., v., 217, ♂ ♀, pl. xvii., f. 9 (wing).

Maxillary palpi short, dusky. Body deep black, shining; mandibles reddish. ♀ Antennæ 17-jointed, scarcely as long as the body. No punctiform impression before the scutellum; furrow of the mesopleuræ faintly rugulose; metathorax short, uneven, rugulose, with two smooth dorsal spaces. Wings dull hyaline; squamulæ fuscous; stigma blackish, narrow, emitting the radial nervure from its middle; 2nd discoidal areolet entirely open at the end; hindwings very narrow, without a transverse vein or axillary areolet. Legs dull testaceous with the femora and tibiæ dusky, except the base of the latter. Abdomen oboval; 1st segment striolate, obconic. Terebra as long as ⅔ of the abdomen. ♂ Similar; the antennæ longer, 19-jointed. Length, 1; wings, 1⅕–2 lin.

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It has only been found in Ireland; common, according to Haliday, in dry sea-weed on the coast.

2. *Syncrasis Halidaii*, Först.

Alysia fuscipes, Hal., Ent. Mag., v., 217, ♀ (not of Nees).

Phænolyta fuscipes, Först., Verh. pr. Rheinl., 1862, p. 264.

♀. Palpi shorter than in the preceding, as also are the antennæ and the general form. Legs blackish. Abdomen suborbicular, depressed. Terebra hardly visible. ♂ unknown. Length, ⅔ wings, 1½ lin.

No more is said of this species, except that it resembles *fucicola*, with which it was taken rarely; found also once in the London district by Walker. The synonymy given by Haliday in the Ent. Mag. is erroneous; *Alysia fuscipes*, Nees, belongs to Genus xi. *Aphæreta*. To avoid confusion, Förster changed the name of the present insect to *Halidaii*, and also founded upon it his uncharacterised genus *Phænolyta*.

iv. Trachyusa, *Ruthe.*

Ruthe, Stett. Zeit., 1854, p. 352.

Palpi of ordinary length, maxillary with 6, labial with 4 joints. Two first joints of the flagellum of nearly equal length. Metathorax not carinated. Radial areolet cultriform, narrow, reaching the tip of the wing; radial nervure straight; 2nd abscissa shorter than the 1st intercubital nervure; 2nd cubital areolet twice as broad as its length, measured along the cubital nervure; anal nervure not interstitial; stigma large, oblong, obtuse at both ends, emitting the radial nervure from its outer half. Second abdominal segment punctulate, dull, with a transverse impression in the middle. Terebra hardly exserted.

The elegant species which forms this genus seems rightly separated from all others; its form is more elongate, and resembles, as Haliday has remarked, that of the Cyclostomous genus *Colastes*; his observation refers, no doubt, to *Xenarcha lustrator* (Ent. Tr., 1885, p. 50). The name *Trachyusa* appeared to Förster too

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much like *Trachusa*, Jur., a genus of bees, and he therefore invented a new name, *Cosmiocarpa*. *Trachusa*, however, is not adopted by hymenopterists, as far as I know, and, besides, it is not the same as *Trachyusa*. For these reasons I have restored the name given by Ruthe.

1. *Trachyusa aurora*, Hal. (Pl. XI., fig. 2, ♂).

Alysia aurora, Hal., Ent. Mag., v., 217, ♂ ♀).
Trachyusa nigriceps, Ruthe, Stett. Zeit., 1854, p. 352.

Variable, usually testaceous, with the head, the metathorax, and the base of the abdomen, black. ♀ Head shining; mandibles testaceous; palpi very pale. Antennæ slender, longer than the body, blackish with the base testaceous, 30–34-jointed. Furrows of the mesonotum converging to a fovea situated before the scutellum; pleuræ somewhat dusky; metathorax rugulose. Wings hyaline; squamulæ and stigma testaceous, the latter almost orange-coloured; posterior angle of the 2nd cubital areolet produced; 2nd discoidal areolet incompletely closed at the end; recurrent nervure hardly rejected. Legs testaceous. Abdomen linear, slightly clavate, depressed; 1st segment short, not much narrowed at the base, rugulose, blackish or fuscous, either at the base or entirely; 2nd thickly punctulate and dull, except at the extremity, transversely bisected by an impressed line; the following segments punctulate at the base. Terebra very short. ♂ Stigma black; posterior abdominal segments blackish. Length, $1\frac{1}{3}$–$1\frac{3}{4}$; wings, $2\frac{3}{4}$–$3\frac{1}{2}$ lin.

Var. 1. Mesonotum fuscous.

Var. 2. ♂ Black; underside of scape, mandibles, legs, and abdomen, testaceous; 1st abdominal segment blackish. Intermediate varieties also occur.

A rare species; taken in England, Ireland, Germany, and Holland. I have only once met with it in England, but Dr. Capron obtained several at Shiere.

v. Alliœa, *Hal.*

Hal., Ent. Mag., i., 265 (1833).

Maxillary palpi 6-, labial 4-jointed. First joint of the flagellum longer than the 2nd. Metathorax carinated. Wings of the ♀ usually as long as the body, but sometimes shortened more or less; radial areolet large, cultriform, reaching the tip of the wing; radial

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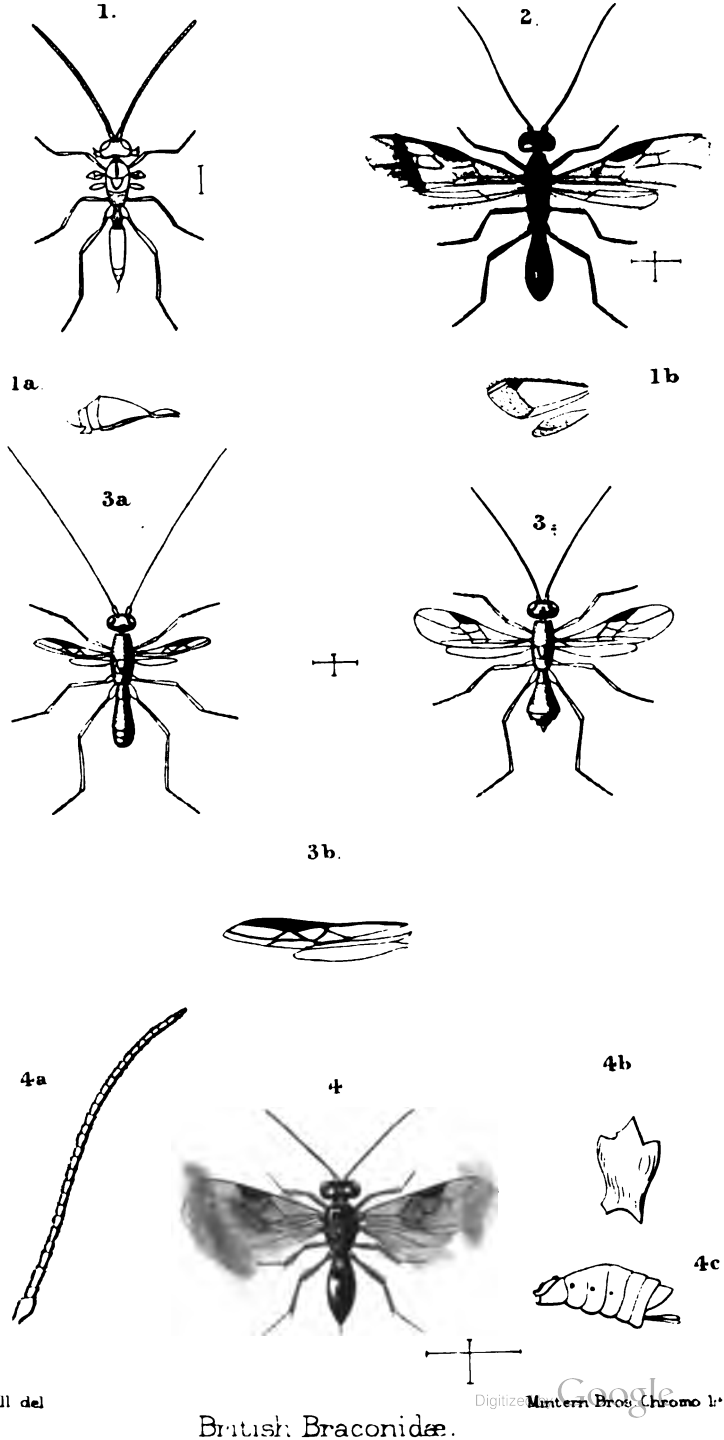

T. A. Marshall del.

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Mintern Bros. Chromo Lith.

British Braconidæ.

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nervure straight, its 2nd abscissa shorter than the 1st intercubital nervure; 2nd cubital areolet twice as broad as long, measured on the cubital nervure; anal nervure interstitial; stigma narrow, lanceolate, emitting the radial nervure from the middle; 2nd discoidal areolet contracted, indistinct; recurrent nervure hardly rejected. Wings of the ♂ not longer than the thorax, very narrow, with the stigma much enlarged, the nervures thickened, the areolets deformed and contracted (see Plate). Second abdominal segment smooth. Terebra almost concealed.

Imperfection of the organs of flight, among the Hymenoptera, usually shows itself in the ♀, but here the rule is reversed; the ♂ has always shortened wings, unfit for flight, the ♀ is but rarely in that condition. We are not able to assign any probable cause for this peculiarity: if ♂s with perfect wings exist anywhere, at least they have never been found. Förster named this genus *Diaspasta*, having apparently overlooked the name proposed long before by Haliday.

1. *Allœa contracta*, Hal. (Pl. XI., fig. 3, ♀; fig. 3*a*, ♂.)

Alysia contracta, Hal., Ent. Mag., v., 218, ♂ ♀, pl. xvii, f. 12, ♀, f. 13, ♂ (wing).

♀ Black; head smaller than in most of this tribe, somewhat shining; eyes prominent; face rugulose; mandibles narrow, tridentate, the two lateral denticulations minute, the middle one acutely prominent; clypeus, mandibles, and palpi ferruginous. Antennæ as long as the body, ferruginous, dark at the tips, 21-jointed, the 3rd joint elongate. Thorax rugose, with the middle of the mesonotum and of the scutellum smoother and rather shining; furrows of the mesonotum distinct, 3 in number, the two lateral shortened; metathorax dentiform behind, as viewed laterally. Wings hyaline; squamulæ testaceous; stigma and nervures fuscous; hindwings narrow. Legs ferruginous. Abdomen depressed, spatulate, shining; 1st segment sublinear, irregularly rugose, the rest smooth. Terebra very short. ♂ Antennæ blackish, narrowly rufous at the base. Nervures and stigma of the contracted wings much darker than those of the ♀; legs rufescent, with the base of the hind coxæ fuscous. Length, about 1 line; wings ♀ 2½, ♂ 1½ lin.

Var. 1. ♀ Mesothorax chestnut-brown in front.

Var. 2. ♀ Wings shortened more or less, the nervulation remaining complete.

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Only noticed in England and Ireland; I find them in a marshy meadow near the river Lynher in Cornwall, and formerly obtained them in Yorkshire and Wiltshire.

vi. Cratospila, *Först.*

Först., Verh. pr. Rheinl., 1862, p. 265.

Maxillary palpi 6-, labial 4-jointed. First joint of the flagellum longer than the 2nd. Metathorax not carinated; furrow of the mesopleuræ crenulate. Radial areolet cultriform, reaching the tip of the wing; radial nervure straight, its 2nd abscissa one half shorter than the 1st intercubital nervure; 2nd cubital areolet somewhat broader than long; anal nervure interstitial; stigma oblong, rather stout, emitting the radial nervure beyond the middle; recurrent nervure hardly rejected; pobrachial areolet of the hindwings shorter than half the præbrachial. Second segment of the abdomen smooth. Terebra very short.

1. *Cratospila circe,* Hal.

Alysia circe, Hal., Ent. Mag., v, 219, ♂ ♀, pl. xvii, f. 6 (wing).

Blackish, or dark brown, with the front of the head and base of the 2nd abdominal segment ferruginous. ♀ Head shining, ferruginous, the border of the occiput and middle or greater part of the vertex blackish; mandibles paler fuscous; palpi long, whitish. Antennæ slender, longer than the body, 30–34-jointed, pale rufous near the base, blackish towards the tips; 3rd joint very long. Thorax dark chestnut-brown, shining; prothorax rufous; furrows of the mesonotum punctulate, converging to a small fovea in front of the scutellum; metathorax blackish, punctato-rugulose. Wings hyaline; squamulæ ochreous; stigma and nervures pale fuscous, the latter becoming obsolete towards the extremity of the wing. Legs slender, pale rufous. Abdomen spatulate, subpetiolate, blackish; 1st segment narrow, obconic, faintly striolate, with scarcely visible tubercles; the following segments smooth; 2nd ferruginous or chestnut-coloured anteriorly; apical segments and belly pale. Terebra very slightly exserted. ♂ First abdominal segment almost linear. Length, $1\frac{1}{3}$; wings, $2\frac{2}{3}$ lin.

Taken by Walker in the London district, but very rare; it has not occurred since the time of Haliday.

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vii. Alysia, *Latreille.*

Latr., H. N., xiii, 177 (1805); *Alysia, Strophæa,* and *Goniarcha,* Först., Verh. Pr. Rheinl., 1862, p. 265.

Second joint of the flagellum not longer than the 1st, which is also short; face short, usually rugulose; clypeus very small; mandibles broad. Furrows of the mesonotum abbreviated in most of the species, the point of their convergence indicated by an oblong fovea, which is not to be confounded with the ordinary antescutellar fovea: this latter is deeply sunk, crenate, or striate; metathorax flattened, sometimes carinated in the middle, and rugulose; furrow of the mesopleuræ crenate or rugose. Stigma distinct, oblong, emitting the radial nervure generally from its posterior or outer half; anal nervure not interstitial; 2nd cubital areolet never larger than the 1st; 1st intercubital nervure as long as the 2nd abscissa of the radial nervure, or longer; 1st cubital areolet separated from the 1st discoidal; pobrachial areolet of the hindwings half as long as the præbrachial. Abdomen somewhat depressed; 1st segment oblong, striolate, with median or submedian tubercles, from which to the base it is gradually narrowed; this segment is generally about one-half longer than its apical breadth; if longer still, and more slender, it makes the abdomen subpetiolate. Terebra slightly exserted.

Table of Species.

(6)	1.	Antennæ rather stout, sometimes shorter than the body; anal nervure springing from the lower angle of the 2nd discoidal areolet; recurrent nervure rejected; radial areolet somewhat lanceolate or acuminate, not reaching the extremity of the wing (*Alysia* and *Strophæa*, Först.).	
(3)	2.	Spiracles of the metathorax large, distinct, and margined	1. *manducator*, Panz.
(2)	3.	Spiracles minute, concealed by the rugosity of the metathorax, not margined.	
(5)	4.	Antennæ ♀ 40-jointed (♂ unknown) ...	2. *soror*, Marsh.
(4)	5.	Antennæ ♂ ♀ 22–24-jointed	3. *rufidens*, Nees.
(1)	6.	Antennæ slender, elongate; anal nervure springing from the middle of the extremity of the 2nd discoidal areolet; recurrent nervure nearly interstitial, rarely evected; radial areolet cultriform with subparallel sides, almost reaching the extremity of the wing (*Goniarcha*, Först.)	
(8)	7.	Hind femora sinuated at the base, incrassated, compressed	4. *loripes*, Hal.
(7)	8.	Hind femora of the usual form.	
(10)	9.	Wings infumated	5. *fuscipennis*, Hal.
(9)	10.	Wings hyaline.	

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(24)	11.	Abdomen sessile, base of the 1st segment about half as wide as the metathorax.	
(17)	12.	Legs dull red, with some black streaks.	
(14)	13.	Antennæ ♀ 25-jointed (♂ unknown) ...	6. *similis*, Nees.
(13)	14.	Antennæ ♀ with more than 25 joints.	
(16)	15.	Mesothoracic furrows inchoate, but effaced on the disk	7. *mandibulator*, Nees.
(15)	16.	Mesothoracic furrows complete, very finely traced, punctulate, converging to a linear fovea in front of the scutellum...	8. *atra*, Hal.
(12)	17.	Legs testaceous or red, without black streaks.	
(21)	18.	Abdomen entirely black.	
(20)	19.	Antennæ ♀ 31-jointed; terebra as long as ½ of the abdomen (♂ unknown)... ...	9. *truncator*, Nees.
(19)	20.	Antennæ ♀ 34-35-jointed; terebra as long as ⅔ of the abdomen	10. *tipulæ*, Scop.
(18)	21.	Abdomen partly red or testaceous.	
(23)	22.	Abdomen, after the 1st segment, testaceous; antennæ ♀ 38-jointed (♂ unknown)	11. *Sophia*, Hal.
(22)	23.	Abdomen black, with the base of the 2nd segment reddish, or with all the segments, except the 1st, red banded with black...	10. *tipulæ*, varr. 1, 2.
(11)	24.	Abdomen subpetiolate, 1st segment narrow, not widened posteriorly.	
(26)	25.	Abdomen entirely black; 1st segment twice as long as its apical breadth ...	12. *incongrua*, Nees.
(25)	26.	Abdomen red, except the 1st segment, which is three times as long as its apical breadth	13. *lucicola*, Hal.

1. *Alysia manducator*, Panz. (Pl. XI., fig. 4, ♀.)

Ichneumon manducator, Panz., F. G., lxxii., 4.

Cryptus manducator, Fab., Piez., 87.

Bassus manducator, Panz., Krit. Rev., ii., 75; Nees, Mag. Ges. Berl., 1814, p. 202.

A. manducator, Latr., Gen. Crust. et Ins., iv., 15; Nees, Mon., i., 239; Hal., Ent. Mag., v., 220, ♂ ♀, pl. xvii., fig. 1 (forewing), fig. 28 (hindwing); Cur., Farm Ins., 144.

A. stercoraria, Latr., H. N., xiii., 177.

A. apicalis and *similis*, Cur., B. E., 141.

A. truncator, Nees, Mon., i., 240, No. 2 (not i., 243, No. 7, also named *truncator*).

Spiracles of the metathorax conspicuous, margined. The largest species, of robust appearance. ♀ black, shining; head very large; face punctato-rugulose; mandibles large, often reddish, wholly or in part; palpi fuscous. Antennæ shorter than in the other species, not much exceeding the length of the head and thorax, black, often

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reddish at the base beneath, 22–35-jointed, flagellum stout, bristly, composed of short cyathiform articulations, which are striolate. Mesothoracic sutures inchoate, broad, punctate; middle lobe of the mesonotum elevated anteriorly; an oblong fovea in front of the scutellum; mesopleuræ rugose, with a broad furrow; metathorax short, almost truncate behind, covered with confused rugosities, carinate in the middle. Wings hyaline, often with an indeterminate brownish stain in the disk; squamulæ rufous; stigma and nervures blackish brown; stigma stout, triangular, emitting the radial nervure a little beyond the middle; 1st intercubital nervure straight, a little longer than the 2nd abscissa; pobrachial areolet of the hindwings half as long as the præbrachial. Legs stout, rufous; tarsi dusky, hairy. Abdomen oboval, depressed, very shining; 1st segment twice as broad at the extremity as at the base, rugulose, obtusely carinate in the middle, excavated at the base; tubercles prominent, obtuse. Terebra very slightly exserted. ♂ similar; antennæ longer than the body, subsetiform, 33-50-jointed. Length, 1¾–3¼; wings, 3¼–7 lin.

Var. ♀. Second abdominal segment rufous, black at the hind margin; legs paler red; wings hyaline; terebra longer. Length, 2⅓; wings, 5 lin. Taken once only, in the London district. Haliday.

This species is common throughout Europe, and probably better known than most of the tribe; it was chosen by Latreille as the type of his genus *Alysia*, and is very indifferently figured by Panzer. The females may be observed, sometimes in considerable numbers, on carrion, excrements, and vegetable refuse, in search of dipterous maggots, in which to deposit their eggs. The sexual instinct attracts thither also the males; but both sexes likewise frequent flowers for the purpose of feeding. They scent the aroma of carrion at a surprising distance, as I once had occasion to observe in watching the remains of a dead rook, upon which they descended in constant succession, apparently from the sky, like vultures. The males generally alighted on blades of grass close to the attractive object, as if to wait for their partners, without interrupting them in their unsavoury occupation. They have been reared from various maggots, as *Lucilia cæsar*, L., *Cyrtoneura stabulans*, Fall., *Hydrotæa dentipes*, Fab., and on one occasion recorded in the Ent. Monthly Mag., from the ferocious larvæ of the coleopterous *Creophilus maxillosus*, L., living habitu-

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ally in carrion. Bouché has described the larva of this *Alysia* as: Oblong, fleshy, white, soft, glabrous, and semitransparent; head somewhat rounded; oral parts indistinct; dorsal segments elevated, the anal segment narrowed. Cocoon covered with a yellowish tissue of great tenuity. Length, 2 lines.

2. *Alysia soror*, Marshall.

A. soror, Marsh., Hymén. d'Europe et d'Algérie, Braconides, vol. ii., 377.

Spiracles of the metathorax inconspicuous, punctiform, not margined. Antennæ ♀ 40-jointed; stigma triangular. (♂ unknown.) Very like the preceding, but differing in the following particulars, which have obliged me to keep it separate. Form more elongate. Antennæ subsetaceous, almost as long as the body, and with five additional joints. Wings hyaline, longer in proportion; 2nd cubital areolet differently shaped, produced in an acute angle towards the base of the wing; 1st intercubital nervure twice as long as the 2nd; in *manducator* the areolet is nearly square, the internal angle is hardly produced, and the 1st intercubital nervure is very little longer than the 2nd. First abdominal segment longer, more narrowed at the base, not elevated in the middle, and without visible tubercles. Other differences are not apparent, but the structure of the antennæ and wings forbids me to consider this a variety of *manducator*. Length, 2½; wings, 5¾ lin.

I captured the only specimen in the London district.

3. *Alysia rufidens*, Nees.

A. rufidens, Nees, Mon., i., 241; Hal., Ent. Mag., v., 221, ♂ ♀, pl. xvii, fig. 2 (wing).

Antennæ ♂ ♀ 22–24-jointed. Stigma elliptic. ♀ black, pubescent; face finely granulated, dull; mandibles reddish; palpi fuscous. Antennæ black, filiform, shorter than the body. Mesothoracic sutures three, the two lateral shortened; metathorax very finely punctato-rugulose. Wings hyaline; nervures fuscous; squamula and stigma piceous, the latter oblong, elliptic, emitting the radial nervure from its exterior third; radial areolet lanceolate, not reaching the extremity of the wing; 3rd abscissa slightly curved towards the end; 1st intercubital nervure curved, almost twice as long as the 2nd abscissa; 1st abscissa rather long, directed

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obliquely. Legs blackish, tips of the trochanters and of the femora, fore tibiæ entirely, and base of the four posterior, brownish. Abdomen shining; 1st segment finely striated, subcarinate at the base. Terebra as long as half the abdomen. ♂ Antennæ almost as long as the body; wings narrower; stigma large, elliptic, black, obliterating the 1st abscissa; 1st cubital areolet very narrow; legs paler than those of the ♀. Length, 1⅓–1¾; wings, 2½–3 lin.

This is probably a parasite of *Ensina sonchi*, L., the larva of which inhabits the buds of *Aster tripolium*. Haliday captured it frequently in Ireland, on the sea-coast, and I have met with both sexes in England; it is also recorded as found in Germany and Holland.

4. *Alysia loripes*, Hal.

A. loripes, Hal., Ent. Mag., v., 222, ♂ ♀.

Hind femora sinuated at the base, incrassated, compressed. ♀ Deep black, shining; mandibles piceous. Mesothoracic sutures finely traced, punctulate, converging to a fovea before the scutellum. Wings hyaline; squamula and stigma piceous brown, the latter narrow, emitting the radial nervure near its extremity; 1st intercubital nervure somewhat longer than the 2nd abscissa. Legs piceous brown; tibiæ and lower edge of femora dull testaceous. Terebra as long as half the abdomen. ♂ unknown. Length, 2; wings, 4 lin.

The only specimen was taken by Walker near Windsor; the antennæ were mutilated.

5. *Alysia fuscipennis*, Hal.

A. mandibulator, var. β, Nees, Mon., i, 243, ♂ ♀.
A. fuscipennis, Hal., Ent. Mag., v., 224, ♂ ♀.

Wings infumated. ♀ Black, shining; mandibles brown; palpi blackish; face hardly punctulate. Antennæ longer than the body 28-37-jointed. Metathorax rugose. Stigma and nervures brown or blackish, the former sometimes rather pale, emitting the radial nervure from its outer half; radial areolet cultriform, not quite reaching the extremity of the wing; 1st abscissa shorter than the thickness of the stigma; 2nd at least as long as the 1st intercubital nervure; 2nd cubital areolet contracted towards the extremity. Legs blackish brown, apex of the trochanters and base of the tibiæ paler. First abdominal segment twice as broad at the extremity

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as at the base, sessile, striolate, sometimes smooth at the extremity, or (in small specimens) almost wholly smooth; the following segments smooth and shining. Terebra as long as the abdomen; valves stout, hairy. ♂ Antennæ longer, 37–40-jointed; 1st abdominal segment scarcely widened posteriorly, faintly striolate, or almost smooth. Length, $1\frac{2}{3}$–2; wings, $3\frac{1}{3}$–$4\frac{1}{3}$ lin.

Var. Abdomen piceous with the 1st segment rufescent and nearly smooth; legs paler piceous.

Taken in England by Walker; in Ireland, rarely, by Haliday. Billups has captured it at Oxshott, and I have two which I captured near Abergavenny, and a third which I found at Nantua last summer, in the Jura. I have seen others from the Continent, taken in Italy and Germany.

6. *Alysia similis*, Nees.

(?) *Bassus similis*, Nees, Mag., Ges. Berl., 1814, p. 103.

(?) *A. similis*, Nees, Mon., i., 240, ♂ ♀; Hal., Ent. Mag., v., 223, ♀.

Antennæ ♀ 25-jointed. Black, shining; mandibles pitchy red. Antennæ stout, shorter than the body. Metathorax punctato-rugulose. Wings hyaline; squamula blackish-brown; stigma blackish, stouter than in the allied species, confounded at the extremity with the metacarp, emitting the radial nervure from near its middle; radial areolet not quite reaching the extremity of the wing; recurrent nervure interstitial. Legs dull red; fore femora streaked with black at the base, the 4 posterior femora streaked throughout their whole length; tarsi, coxæ, and trochanters blackish. First abdominal segment regularly striated. Terebra, according to Nees, half as long, according to Haliday a quarter as long, as the abdomen. ♂ Similar, according to Nees, but not described; unknown to Haliday. Length, $1\frac{1}{3}$; wings, 3 lin.

This species is unknown to me. Haliday expresses a doubt whether his insect was the same species as the *similis* of Nees, on account of the difference in size, and in the length of the terebra. In other respects the descriptions of these authors coincide.

Taken once in the London district, with *A. manducator*.

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7. *Alysia mandibulator*, Nees.

Bassus mandibulator, Nees, Mag., Ges. Berl., 1814, p. 204.

A. mandibulator, Nees, Mon., i., 242 (not the var.); Hal., Ent. Mag., v., 224, ♂ ♀.

Mesothoracic sutures inchoate, but effaced on the disk. ♀ Deep black, shining; mandibles pitchy red. Head and thorax vaguely punctulate, thinly beset with whitish hairs. Antennæ a little longer than the body, filiform, rather stout, 32–34-jointed. The effaced sutures of the mesonotum are indicated by rows of very fine punctures; before the scutellum is a median line of similar punctures; metathorax rugose. Wings dingy hyaline; squamula reddish; nervures brown; stigma reddish, subelliptic, emitting the radial nervure from its exterior half; radial areolet (measured along the costa) hardly longer than the stigma, lanceolate, not reaching the extremity of the wing; 2nd abscissa a little shorter than the 1st intercubital nervure; 3rd abscissa slightly curved at the extremity; recurrent nervure interstitial; pobrachial areolet of the hind wing half as long as the præbrachial. Legs as in the preceding species; hind tibiæ sometimes dark at the extremity. Abdomen elongate-oval, deep black, brilliant; 1st segment somewhat narrowed towards the base, regularly striolate. Terebra about $\frac{2}{3}$ of the length of the abdomen. ♂ unknown.

Haliday's only specimen had a dark stigma, but in my four specimens the stigma is of a reddish tinge. Walker first detected this species in England, and I have since found it in some numbers in an osier-bed at Nunton, Wilts, but females only: more I believe are in Dr. Capron's collection.

8. *Alysia atra*, Hal.

A. atra, Hal., Ent. Mag., v., 223, ♂ ♀, pl. xvii, f. 3 (wing).

Mesothoracic sutures finely traced, complete, punctulate, converging to a linear fovea before the scutellum. Very like the preceding, but more hairy. ♀ deep black, shining, with the extremity of the abdomen pale piceous; mandibles reddish. Antennæ a little shorter than the body, 29–31-jointed. Wings hyaline; squamula pale brown; stigma dull testaceous. Legs reddish; coxæ, upper side of femora, and tarsi, blackish. Terebra as long as $\frac{2}{3}$ of the abdomen. ♂ antennæ longer, 35-jointed; stigma black;

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1st cubital areolet narrower ; 2nd smaller ; radial hardly attaining the tip of the wing ; recurrent nervure somewhat rejected. This ♂ much resembles *rufidens* (No. 3), but differs in the length of the antennæ, and the neuration. Length 1½ ; wings, 3⅓ lin.

Very rare in North Ireland, according to Haliday. My collection contains two ♀s taken respectively in Yorkshire (Lastingham) and Wiltshire (Nunton), and one ♂ captured at Plumstead by Mr. Billups. It was also found by Mr. Walker in Finmark.

9. *Alysia truncator*, Nees.

Bassus truncator, Nees, Mag. Ges. Berl., 1814, p. 204.
A. truncator, Nees, Mon., i., 243, No. 7 (not i., 240, No. 2, also named *truncator*, which is a synonym of *manducator*) ; Hal., Ent. Mag., v., 222, ♂ ♀.

Antennæ ♀ 31-jointed ; terebra as long as ⅓ of the abdomen (♂ unknown). Deep black, shining ; mandibles ferruginous, black at the points, on the sides, obtusely denticulated ; palpi ferruginous ; face shining, nearly smooth. Antennæ rather stout, almost as long as the body ; 1st joint ferruginous, fuscous underneath ; 2nd ferruginous. Metathorax finely punctulate. Wings hyaline ; squamula ferrugiuous ; stigma obscurely reddish ; nervures brown ; radial areolet acuminate, hardly reaching the tip of the wing ; 1st intercubital nervure longer than the 2nd abscissa ; interior angle of the 2nd cubital areolet considerably produced. Legs rufo-testaceous, tarsi darkened at the tips. Abdomen compressed at the extremity ; 1st segment very slightly narrowed towards the base, depressed, rugulose. The ♂ mentioned by Nees is doubtful :—Similar to the ♀ ; antennæ longer than the body ; hind femora and hind tibiæ black at the extremity ; their tarsi also dark. Length barely 2 lin.

I have not seen this species, which was found in England by Curtis. According to Goureau, it is a parasite of *Agromyza macquarti*, Rob. Desv., the larva of which mines the leaves of *Verbascum thapsus* ; and of *Anthomyia platyura*, Meig., the larva of which inhabits the bulbs of *Cepa ascalonica*, the eschalot.

10. *Alysia tipulæ*, Scop. (Pl. XII., fig. 1, ♀.)

Ichneumon tipulæ, Scop., Ent. Car., 288 (1763).
Bassus abdominator, Nees, Mag. Ges. Berl., 1814, p. 205.

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A. abdominator, Nees, Mon., i., 245, ♂ ♀.
A. tipulæ, Hal., Ent. Mag., v., 224, ♂ ♀, pl. xvii, f. 4 (wing).

Antennæ ♀ 34–35-jointed; terebra as long as $\frac{2}{3}$ of the abdomen. Black, shining; abdomen often partly red, in varieties; mandibles testaceous; palpi rufous. Antennæ rather stout, as long as the body, black, with the two first joints testaceous; cheeks often more or less rufescent. Prothorax piceous; mesothoracic sutures inchoate, effaced posteriorly; before the scutellum is an oval fovea; metathorax rugose. Wings hyaline; squamula rufous; nervures and stigma testaceous, the latter emitting the radial nervure from its outer half; radial areolet cultriform, not quite reaching the tip of the wing; 2nd discoidal areolet emitting the anal nervure from the middle of its angular extremity; 1st intercubital nervure somewhat shorter than the 2nd abscissa; recurrent nervure interstitial. Legs testaceous, with dark tarsi; an indistinct dark spot on the upper side of the hind coxæ. Abdomen oblong-oval; 1st segment finely rugulose, hardly twice as wide at the extremity as at the base; 1st suture deeply impressed; 2nd and following segments very smooth, generally more or less brownish-black, with the 3 or 4 apical segments paler brown. ♂ antennæ longer than the body, filiform, 43-jointed; stigma fuscous; abdomen entirely black. Length $1\frac{3}{4}$–2; wings, $3\frac{2}{3}$–$4\frac{1}{2}$ lin.

Var. 1. ♂ ♀. Second abdominal segment rufescent at the base.

Var. 2. ♀. Abdomen, after the 1st segment, rufous, each segment banded with black; apical segments pale. This variety, at least in England, is more common than the typical form, and most of my specimens belong to it.

Common throughout Europe, frequenting fungi in woods, and parasitic probably in the larvæ of *Mycetophila*, and its allies.

11. *Alysia Sophia*, Hal.

A. Sophia, Hal., Ent. Mag., v., 225, ♀.

♀. Antennæ 38-jointed, flavo-rufous with the extremity fuscous (♂ unknown). Black, shining, abdomen testaceous, except the first segment. Clypeus brown; mandibles rufous; palpi the same, but paler. Antennæ a little longer than the body. Wings hyaline; squamula and stigma flavo-rufous. Legs flavo-rufous, with paler coxæ. Second abdominal segment testaceous, but darker than the rest. Terebra as long as the 3 or 4 apical segments. Length, $1\frac{1}{4}$; wings, 4 lin.

Taken, once only, by Haliday, in Ireland.

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12. *Alysia incongrua*, Nees.

A. incongrua, Nees, Mon., i., 244 (?); Hal., Ent. Mag., v., 225, ♀.

A. Lucia, Hal., Ent. Mag., v., 226, ♂.

Abdomen black; 1st segment sublinear, twice as long as its apical breadth. ♀ Black, shining; mandibles rufous. Antennæ with more than 29 joints (broken), as long as the body; 2 first joints rufous beneath, or wholly rufous. Metathorax rugose, reticulated Wings hyaline; squamula flavo-rufous; stigma stout, blackish. Legs pale testaceous; apex of hind tibiæ, and their tarsi, fuscous. Abdomen subpetiolate or subsessile, black, brownish towards the extremity; 1st segment of equal breadth throughout, longitudinally rugulose. Terebra as long as $\frac{2}{3}$ of the abdomen. ♂ Antennæ slender, longer than the body, 40-jointed; second cubital areolet somewhat longer than in other species; legs flavescent, apex of hind tibiæ, and their tarsi, fuscous; 2nd abdominal segment obscurely rufescent at the base. Length, ♀ $2\frac{1}{4}$; wings, 5; ♂ length, $1\frac{1}{4}$; wings, $4\frac{1}{2}$ lin.

The doubt attaching to the identity of the *incongrua* of Nees arises from that author's omission of the form of the first abdominal segment. I possess only the ♂, which is undoubtedly the *Lucia* of Haliday, as he himself conjectured. It was taken near Plymouth by Mr. Bignell. The ♂ described in the Ent. Mag. was from Edinburgh.

13. *Alysia lucicola*, Hal.

A. lucicola, Hal., Ent. Mag., v., 226, ♂ ♀.

Abdomen, after the 1st segment, rufo-testaceous; 1st segment linear, three times as long as its apical breadth. ♀ Black, shining; mandibles rufous; palpi ferruginous. Antennæ a little longer than the body, 32-jointed; the two first joints testaceous. Mesothoracic sutures complete; a circular fovea before the scutellum; metathorax rugose. Wings hyaline with a faint dusky tinge; squamula pale ferruginous; nervures and stigma fuscous; radial areolet cultriform, reaching the tip of the wing; 1st intercubital nervure very obliquely placed, a little longer than the 2nd abscissa; recurrent nervure evected; 2nd discoidal areolet emitting the anal nervure from the middle of its angular extremity; 2nd cubital areolet a little narrowed outwardly. Legs testaceous; coxæ paler; tips of the hind tibiæ, and their tarsi, infuscated. Abdomen pyriform, somewhat compressed; 1st segment black, striolate, making

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one-third of the total length of the abdomen; the following segments smooth, testaceous. Terebra a little longer than half the abdomen. ♂ Antennæ one-half longer than the body, slender, setaceous, 38-jointed; abdomen somewhat clavate, depressed, of a more dingy testaceous than that of the ♀, the apical segments infuscated. Length, 2; wings, 4¼ lin.

The ♀ is not unlike *A. tipulæ* (No. 10), but immediately distinguishable by the form of the 1st abdominal segment. Taken first by Walker in England; in Ireland, rarely, by Haliday, amongst fungi. I have three specimens, 2 ♂, 1 ♀, which I captured in Devonshire.

viii. Tanycarpa, *Förster.*

Först., Verh. Pr. Rheinl., 1862, p. 265.

Fourth joint of the antennæ shorter than the 3rd. Metathorax not carinated; furrow of the mesopleuræ crenate. Stigma elongate, emitting the radial nervure before the middle; radial areolet reaching the tip of the wing; recurrent nervure interstitial; 1st intercubital nervure longer than the 2nd abscissa; 1st cubital areolet separated from the 1st discoidal; 2nd complete, separated from the first; anal nervure springing from the middle of the extremity of the 2nd discoidal areolet. First abdominal segment somewhat elongate; 2nd segment smooth, shining. Terebra considerably exserted.

Table of Species.

(4) 1. Abdomen entirely black.
(3) 2. Antennæ 22–25-jointed ... ... 3. *ancilla*, var.
(2) 3. Antennæ 33–37-jointed ... ... 1. *gracilicornis*, Nees.
(1) 4. Abdomen red and black, or red and fuscous.
(6) 5. Abdomen red, with the 1st segment black, or black with segments 2-3 red ... . 2. *rufinotata*, Hal.
(5) 6. Abdomen blackish or fuscous, with the 1st segment and base of the 2nd reddish, or impure testaceous ... ... 3. *ancilla*, Hal.

1. *Tanycarpa gracilicornis*, Nees.

Bassus gracilicornis, Nees, Mag., Ges. Berl., 1814, p. 206.

Alysia gracilicornis, Nees, Mon., i, 247; Hal., Ent. Mag., v., 228, ♂ ♀, pl. xvii, f. 11 (wing).

♀. Black, shining; face minutely punctulate; clypeus and mandibles ferruginous, palpi paler. Antennæ slender, nearly one-half longer than the body, black with the two first joints rufous, 33–37-jointed. Metathorax rugulose, sometimes smooth at the

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base. Wings hyaline; squamula pale ferruginous; nervures slender; stigma dull testaceous, very long, linear, emitting the radial nervure at the end of the 1st third; radial areolet cultriform; 2nd cubital areolet narrowed outwardly. Legs flavo-rufous with the coxæ paler; tips of 4 anterior tarsi, hind tarsi entirely, and tips of hind tibiæ, infuscated. Abdomen subpetiolate; 1st segment elongate, almost linear, hardly widened behind, with two dorsal carinæ vanishing posteriorly, very finely rugulose. Terebra as long as $\frac{2}{3}$ of the abdomen. ♂ Similar; antennæ about twice as long as the body, 39–42-jointed; 2nd abdominal segment sometimes piceous. Length, $1\frac{2}{3}$–2; wings, $3\frac{2}{3}$–$4\frac{3}{4}$ lin.

Parasite of *Agromyza cicerinæ*, Rondani. It has occurred in Germany, Italy, and Ireland.

2. *Tanycarpa rufinotata*, Hal.

Alysia rufinotata, Hal., Ent. Mag., v., 227, ♂ ♀, pl. xvii, f. 13 (wing).

Abdomen rufous with the 1st segment black, or black with segments 2–3 rufous. ♀ Black; head very large shining, the face somewhat duller; clypeus, mandibles, and palpi rufous. Antennæ hardly longer than the body, 35-jointed, black with the two basal joints rufous. Mesothoracic sutures inchoate; a fovea in front of the scutellum; metathorax rugulose. Wings hyaline; squamula rufous; nervures and stigma fuscous, the latter linear-lanceolate, emitting the radial nervure a little before the middle; 2nd cubital areolet narrowed externally; lower exterior angle of the 2nd discoidal areolet produced. Legs rufous; hind tarsi and tips of hind tibiæ infuscated. Abdomen clear red, or more or less tinged with brown; 1st segment obconic, attenuated towards the base, rugulose. Terebra as long as the abdomen. ♂ Antennæ longer, 39-jointed. Length, $1\frac{3}{4}$–2; wings, $3\frac{1}{4}$–4 lin.

England and Ireland; somewhat rare. Found in autumn, amongst fungi.

3. *Tanycarpa ancilla*, Hal.

Alysia ancilla, Hal., Ent. Mag., v., 227, ♂ ♀.

Abdomen pitchy black, with the first segment and base of the 2nd rufescent, or dull testaceous. ♀ Brownish-black, shining; clypeus and mandibles rufous; palpi paler. Antennæ hardly longer than the body, 21–25-jointed, blackish with the two first joints and base of the 3rd flavo-rufous. Discal fovea of the

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mesonotum very small ; furrow of the mesopleuræ finely traced, crenulate. Wings hyaline ; squamula and stigma pale ochreous ; nervures brownish, arranged as in the preceding ; hind wings narrower, without a transverse nervure. Legs pale flavo-rufous, hind tarsi and tips of hind tibiæ scarcely darker. First abdominal segment elongate, finely rugulose. Terebra as long as $\frac{2}{3}$ of the abdomen. ♂ Antennæ somewhat longer than the body, with the same number of joints as those of the ♀ ; stigma fuscous. Length, 1 ; wings, 2½ lin.

Var. Abdomen entirely pitchy black, concolorous.

England and Ireland ; the males, according to Haliday, more common than the females.

ix. Pentapleura, *Förster*.

Först., Verh. Pr. Rheinl., 1862, p. 264.

Fourth joint of the antennæ shorter than the 3rd. Maxillary palpi 6-, labial 3- or 4-jointed. Metathorax not carinated ; furrow of the mesopleuræ smooth or obsolete. Stigma small, sometimes indeterminate at the extremity where it is confounded with the metacarp, and sometimes subobsolete ; radial areolet ample, cultriform, attaining the tip of the wing ; 1st intercubital nervure longer than the 2nd abscissa ; 1st cubital areolet separated from the 1st discoidal ; 2nd cubital areolet complete, pentagonal ; recurrent nervure plainly evected ; 2nd discoidal areolet imperfectly closed ; anal nervure subinterstitial. Terebra considerably exserted.

The small black species of this genus may be recognized at once by their wings ; the 2nd cubital areolet is produced angularly to meet the recurrent nervure, thus forming a 5th side to the areolet ; hence the name of the genus. This structure, however, must be considered ideal, for the nervures, as usual, lose their colour on approaching the anastomosis. The antennæ exhibit a diminished number of joints, and the labial palpi are sometimes triarticulate.

The species are not easy to tabulate, but perhaps the following attempt may conduce to their determination :—

(2)	1. Stigma much attenuated, subobsolete, confounded with the metacarp. Antennæ ♀ 17, ♂ 22-jointed...	i. *angustula*, Hal.
(1)	2. Stigma of ordinary form, or only moderately narrowed.	
(4)	3. Stigma of ordinary form. Antennæ ♀ 24-, ♂ 27-jointed	ii. *fuliginosa*, Hal.
(3)	4. Stigma narrowed, but distinct, confounded with the metacarp only at its extremity. Antennæ ♀ 19-, ♂ 25-jointed	iii. *pumilio*, Nees.

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1. *Pentapleura angustula*, Hal.

Alysia angustula, Hal., Ent. Mag., v., 229, ♀; pl. xvii, f. 8 (wing).

Stigma subobsolete, confounded with the costa and metacarp. Antennæ ♀ 17–, ♂ 22-jointed. ♀ Black or pitchy; mandibles dull testaceous; labial palpi 3-jointed. Antennæ rather shorter than the body. Mesopleuræ smooth, with no trace of a furrow; metathorax nearly smooth. Wings hyaline, nervures fuscescent; radial areolet very long; 1st intercubital nervure hardly longer than the 2nd abscissa; 1st abscissa longer than the greatest breadth of the stigma; hindwings narrow; pobrachial areolet short; only one transverse nervure. Legs dull testaceous. Abdomen sessile, somewhat compressed; 1st segment smooth, obtusely carinated in the middle. Terebra as long as the abdomen, falcate, ascending. ♂ Antennæ twice as long as the body, slender, black with the two basal joints testaceous; abdomen oval, depressed. Length, ¾; wings, 1¼–2 lin.

Found in England and Ireland, but seldom; I have one specimen, captured in Northants.

2. *Pentapleura fuliginosa*, Hal.

Alysia fuliginosa, Hal., Ent. Mag., v., 228, ♂; 519, ♀.

Stigma oblong, well defined at both ends. Antennæ ♀ 24–, ♂ 27-jointed. ♀ Black, shining; mandibles dull testaceous; labial palpi 4-jointed. Antennæ as long as the body. Mesopleuræ with no trace of a furrow; metathorax short, rugulose. Wings subhyaline; nervures and stigma fuscous, the former disposed as in *angustula*; 1st abscissa only half as long as the thickness of the stigma. Legs dull testaceous. Abdomen compressed near the apex; 1st segment striolate. Terebra as long as ⅔ of the abdomen. ♂ Antennæ one-half longer than the body. Length, 1; wings, 2⅓ lin.

Less common than the following species; Haliday took his specimen in Kent; I have a ♂ from Abergavenny, and a ♀ from Bishop's Teignton.

3. *Pentapleura pumilio*, Nees.

Bassus pumilio, Nees, Mag., Ges. Berl., 1814, p. 205.

Alysia pumilio, Nees, Mon., i., 244, ♀; Hal., Ent. Mag., v., 228, ♂ ♀; pl. xvii, f. 7 (wing).

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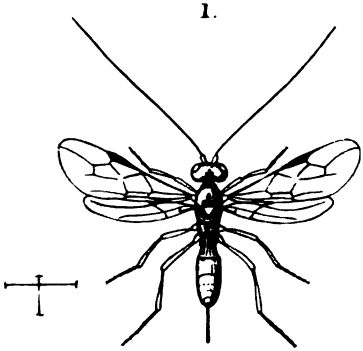

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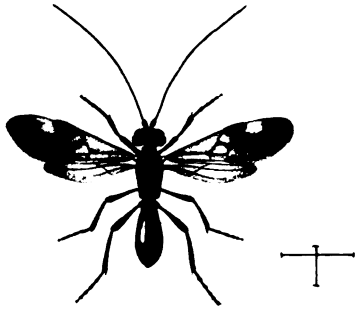

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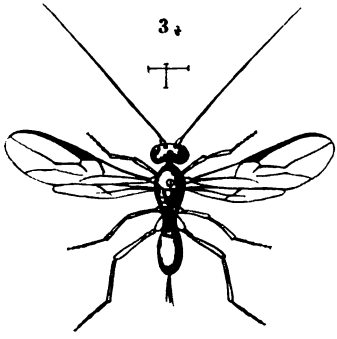

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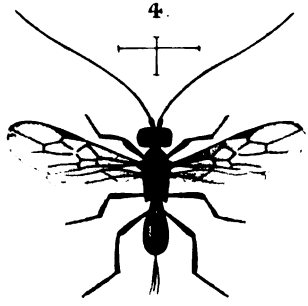

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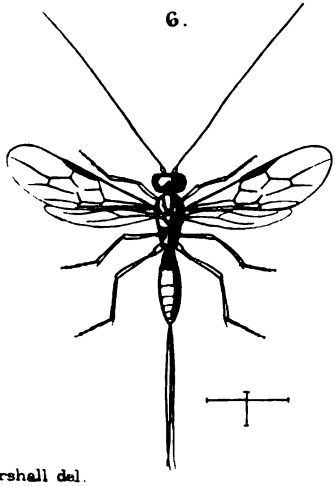

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Mintern Bros. Chromo lith

British Braconidæ

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Stigma attenuated, confounded with the metacarp at its outer end. Antennæ ♀ 19-, ♂ 25-jointed. ♀ Black, shining; mandibles reddish; labial palpi 3-jointed. Antennæ shorter than the body, black; 3rd joint elongate. Mesothoracic sutures inchoate, almost complete in large specimens; a dorsal fovea before the scutellum; furrow of the mesopleuræ barely indicated, unpunctured; metathorax indistinctly rugulose. Wings hyaline; squamula fuscous; nervures and stigma pale brown or testaceous; 1st abscissa a little shorter than the greatest thickness of the stigma; pobrachial areolet of the hindwings somewhat less than half as long as the præbrachial. Legs dull testaceous; coxæ, and tips of the femora and tibiæ, infuscated. Abdomen oblong-oval; 1st segment obconic, finely striolate. Terebra as long as ⅓ of the abdomen. ♂ Antennæ one-half longer than the body; legs longer, more slender, and darker; wings slightly infumated. Length, ¼–1; wings, 2½ lin.

Common in England and Ireland; Nees was acquainted with it in Germany, and Walker obtained it in his tour through Finmark.

x. Idiasta, *Förster.*

Först., Verh. Pr. Rheinl., 1862, p. 265.

Fourth joint of the antennæ longer than the 3rd. Maxillary palpi 6-, labial 4-jointed. Mesothoracic sutures deeply impressed, complete, crenulate or merely inchoate; metathorax carinated at the base. Stigma large, determinate; 1st intercubital nervure longer than the 2nd abscissa; 1st cubital areolet separated from the 1st discoidal; 2nd quadrangular; radial areolet lanceolate, not reaching the tip of the wing; 3rd abscissa straight; recurrent nervure not evected; 2nd discoidal areolet completely closed; anal nervure not interstitial. Terebra considerably exserted.

(2) 1. Black with a tint of bronze, submetallic; wings clouded with obscure patches; anal nervure not interstitial ... ... i. *maritima*, Hal.

(1) 2. Black without a metallic tinge; wings infumated, without darker spots; anal nervure nearly interstitial ... ... ii. *Nephele*, Hal.

1. *Idiasta maritima*, Hal. (Pl. XII., fig. 2, ♀.)

Alysia maritima, Hal., Ent. Mag., v., 230, ♂ ♀; pl. xvii, f. 14 (wing).

♀ Black, with a tint of bronze, submetallic, shining, beset with whitish pubescence; face and margin of the vertex very finely

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rugulose ; mandibles reddish ; palpi dusky. Antennæ filiform, as long as the body, 24–25-jointed, black with the base of the flagellum dull testaceous. Mesothoracic sutures crenate-punctured, separated posteriorly by a rugose space traversed by an oblong fovea ; metathorax rugose with two smooth basal areæ, separated by a carina. Wings yellowish, with all the transverse nervures, and a blotch near the tip of the radial areolet, clouded with fuscous ; squamula rufous ; nervures and stigma fuscous, the latter large, semi-oval, cutting off the greater part of the 1st abscissa recurrent nervure conspicuously rejected ; anal nervure springing below the middle of the extremity of the 2nd discoidal areolet ; pobrachial areolet of the hindwings almost as long as half the præbrachial. Legs dull testaceous ; coxæ blackish. Abdomen depressed, shining, rounded at the extremity ; 1st segment one-half longer than broad, narrowed towards the base, longitudinally striolate, elevated in the middle at the base. Terebra as long as $\frac{2}{3}$ of the abdomen. ♂ Similar; antennæ 29-jointed. Length, $1\frac{1}{2}$–2 ; wings, 3–4 lin.

This species occurs sparingly amongst decaying sea-weeds on the coast: the localities named are Hebrides, Yorkshire, Hampshire. I have taken it on Lymington Salterns, and Mr. Billups found it at Dulwich.

2. *Idiasta Nephele*, Hal.

Alysia Nephele, Hal., Ent. Mag., v., 231, ♀.

Black without metallic tinge ; wings infumated without darker blotches ; anal nervure almost interstitial. ♀ Mandibles reddish ; eyes minutely pubescent. Antennæ as long as the body, filiform, 20-jointed, blackish, pitchy at the base beneath. Mesothoracic sutures inchoate; a small dorsal fovea before the scutellum; metathorax punctato-rugose. Wings narrow ; squamula brownish ; stigma fuscous, not so stout as in the preceding; recurrent nervure not much rejected; pobrachial areolet of the hindwings shorter. Terebra about as long as the abdomen. ♂ unknown. Length, 1 ; wings, $2\frac{1}{2}$ lin.

One example taken by Haliday in the Hebrides, and another in Finmark by Walker.

xi. Aphæreta, *Förster*.

Först., Verh. pr. Rheinl., 1864, p. 264.

Fourth joint of the antennæ longer than the 3rd. Maxillary palpi 6-, labial 4-jointed. First cubital areolet confounded with the

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1st discoidal (as in gen. iii., *Syncrasis*); 2nd cubital areolet separated from the 1st; 1st intercubital nervure shorter than the 2nd abscissa; 2nd discoidal areolet obsolete; anal nervure interstitial; hindwings very narrow, pobrachial areolet and transverse nervure obsolete. Terebra considerably exserted.

With this genus commences the second artificial section of the *Alysiids*, comprising those which have an elongated 2nd cubital areolet; in other words, the 1st intercubital nervure is shorter than the 2nd abscissa of the radial nervure. There is only one species, variable in size and appearance, but with characters that cannot be mistaken.

1. *Aphæreta cephalotes*, Hal.

Stephanus minutus, Nees, Mag. Ges. Berl., 1811, p. 5, ♀.
Alysia fuscipes, Nees, Mon., i., 254, ♀ (not of Hal.).
Bassus minutus, var. Nees, Mag. Ges. Berl., 1814, p. 212.
Alysia minuta, var. γ, Nees, Mon. i., 252, ♀.
Alysia cephalotes, Hal., Ent. Mag., v., 231, ♂ ♀, pl. xvii, f. 18 (wing).
Alysia confluens, Ratz., Ichn. d. Först., i., 55.

Black or pitchy-black, shining; head large; mandibles and palpi rufous. ♂ Antennæ a little longer than the body, blackish, with the two first joints rufous, 19–25-jointed. Prothorax often piceous; mesothoracic sutures usually distinct, smooth, less visible in small specimens; no dorsal fovea before the scutellum; furrow of the mesopleuræ rugose; metathorax rugulose, smoother in the middle and towards the base. Wings subhyaline; squamula brown; nervures and stigma testaceous, more or less dusky, the latter much attenuated, confounded posteriorly with the metacarp; radial areolet cultriform, elongate, reaching the tip of the wing; 2nd cubital areolet elongate, narrowed towards the end; 2nd abscissa almost twice as long as the 1st intercubital nervure; anal nervure springing from the cubital; no 2nd discoidal areolet. Legs dull rufous. First abdominal segment obconic, finely rugulose, sometimes rufescent. Terebra as long as ⅔ of the abdomen. ♂ similar; antennæ hardly twice as long as the body, 27-jointed. Length, 1–1¼; wings, 2¼–3 lin.

Var. 1. ♀. Form more slender. Antennæ one-half longer than the body, blackish, broadly testaceous at the base, 25-jointed; mesonotum with a fovea before the scutellum; furrow of the

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mesopleuræ very finely traced, crenulate; metathorax nearly smooth; legs slender, elongate, flavo-rufous; wings hyaline. Length, 1; wings, $2\frac{1}{2}$ lin. This may be, as suggested by Haliday, a distinct species. I possess a single specimen.

Var. 2. ♂. Slender; entirely black; antennæ slender (mutilated); mesothoracic sutures effaced; no dorsal fovea; wings hyaline; nervures and stigma pale testaceous, the latter almost obsolete; legs dark brown with the knees and 2nd joint of the trochanters rufescent. Length, $\frac{3}{4}$; wings nearly 2 lin. This variety, communicated by Dr. Capron, seems as doubtful as the preceding; it may be the *fuscipes* of Nees, too briefly described, but which, without further information, I must regard as a synonym of *cephalotes*, differing only in the darker colour of the legs.

Var. 3 ♀. Length, $1\frac{1}{2}$; wings, $3\frac{1}{2}$ lin. Antennæ longer than the body, 24-jointed; mesothoracic sutures complete; the dividing nervure between the 1st cubital and the 1st discoidal areolets inchoate. The large size of this specimen, taken in Cornwall, gives it a different aspect from the others, yet its essential characters are the same.

This species is rather common: it has been noticed in England, Ireland, Germany, Holland, and Russia, frequenting sea-weed on the coasts, as well as inland situations. Ratzeburg believed his *Alysia confluens* to be a parasite of the lepidopteron *Amphidasys betularius*, L.; but it came most probably from some dipterous larva which had escaped his observation.

xii. Phænocarpa, *Förster*.

Först., Verh. Pr. Rheinl., 1862, p. 267.

Fourth joint of the antennæ longer than the 3rd. Maxillary palpi 6-, labial 4-jointed. First cubital areolet complete; 1st intercubital nervure shorter than the 2nd abscissa; 2nd discoidal areolet complete; anal nervure subinterstitial, rarely interstitial; pobrachial areolet of the hindwings not half as long as the præbrachial. With few exceptions, the antennæ are long and slender, the 4th and 5th joints both longer than the 3rd; the rugosities of the metathorax and 1st abdominal segment are less distinct than in *Alysia*; the clypeus larger; face convex and nearly smooth; stigma oblong, emitting the radial nervure beyond the middle, often attenuated and indeterminate towards the tip of the wing. The species much resemble *Alysia*, but must be distinguished by the longer 2nd cubital areolet (see table of genera).

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I have included here three more of Förster's genera, *Homophyla*, *Asobara*, and *Idiolexis*, each adapted to a single species. The European fauna contains 17 known species of *Phænocarpa*, of which 14 are British. The number would, no doubt, be greatly increased if foreign entomologists were to turn their attention to this tribe; but, in our country, few species, if any, still remain undetected.

TABLE OF SPECIES.

(2)	1. Radial areolet not reaching the tip of the wing (*Homophyla*, Först.)	1. *pullata*, Hal.
(1)	2. Radial areolet reaching the tip of the wing.	
(4)	3. Pobrachial areolet produced beyond the præbrachial; 2nd discoidal areolet small, oval instead of quadrate; radial areolet of the hindwings almost bisected by an accessory transverse nervure (*Idiolexis*, Först.) ...	2. *punctigera*, Hal.
(3)	4. Pobrachial areolet not longer than the præbrachial; 2nd discoidal areolet of ordinary size and form, rarely obsolete or subobsolete; radial areolet of the hindwings simple.	
(6)	5. Second discoidal areolet obsolete; stigma much attenuated, indeterminate (*Asobara*, Först.)	3. *tabida*, Nees.
(5)	6. Second discoidal areolet complete, or nearly so; stigma more or less conspicuous.	
(8)	7. Transverse nervures bordered with brown...	4. *picinervis*, Hal.
(7)	8. Transverse nervures not so bordered.	
(10)	9. Metathorax transversely subcarinate near the extremity; head generally rufous, body black; or both head and body testaceous; stigma semioval, rather stout ...	5. *ruficeps*, Nees.
(9)	10. Metathorax not subcarinate near the extremity; head concolorous with the body, black or testaceous; stigma less stout, often much attenuated.	
(14)	11. Antennæ ♀ hardly as long as the body, 19–21-jointed; ♂ unknown.	
(13)	12. Second cubital areolet rather short, the 2nd abscissa being very little longer than the 1st intercubital nervure	6. *Maria*, Hal.
(12)	13. Second cubital areolet elongate, the 2nd abscissa twice as long as the 1st intercubital nervure	7. *Galatea*, Hal.
(11)	14. Antennæ ♂ ♀ much longer than the body, consisting of more than 21 joints.	
(16)	15. Body rufous or testaceous, with a spot on the vertex, the greater part of the thorax, and the 1st abdominal segment, fuscous...	8. *Eugenia*, Hal.
(15)	16. Body almost entirely black, or pitchy black.	
(20)	17. Mesothoracic sutures complete, meeting just before the scutellum.	
(19)	18. Antennæ 24-32-jointed; terebra as long as ⅓ of the abdomen	9. *conspurcator*, Hal.
(18)	19. Antennæ 33–41-jointed; terebra longer than the whole body	10. *pratellæ*, Curtis.

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(17) 20. Mesothoracic sutures inchoate, effaced posteriorly.
(24) 21. Wings infumated.
(23) 22. Terebra shorter than the abdomen; ♂ unknown ... ... 11. *Nina*, Hal.
(22) 23. Terebra longer than the abdomen ... ... 12. *Eunice*, Hal.
(21) 24. Wings hyaline.
(26) 25. Abdomen black or pitchy black ... ... 13. *flavipes*, Hal.
(25) 26. Abdomen, after the 1st segment, reddish or testaceous ... ... 14. *livida*, Hal.

1. *Phænocarpa pullata*, Hal. (Pl. XII., fig. 5, wing.)

Alysia pullata, Hal., Ent. Mag., v., 232, ♂ ♀, pl. xvii, f. 15 (wing).

Radial areolet not reaching the tip of the wing. ♀ Deep black, shining; mandibles brownish; palpi dusky. Antennæ as long as the body, 34-jointed. Mesothoracic sutures complete, crenulate, meeting in an acute angle near the scutellum; metathorax rugulose. Wings subhyaline: squamula rufous; nervures and stigma fuscous, the latter oblong, emitting the radial nervure beyond the middle; radial areolet short, lanceolate; radial nervure curved; 2nd abscissa very little longer than the 1st intercubital nervure; recurrent nervure interstitial; pobrachial areolet of the hindwings shorter than half the præbrachial. Legs blackish or brown, the forelegs lighter, as well as the underside of all the femora, and the base of the tibiæ. Abdomen depressed, shining; 1st segment hardly longer than broad, striolate. Terebra not surpassing the apex of the abdomen, directed upwards. ♂ Similar; antennæ longer than the body, 38-jointed. Length, 2; wings, 4 lin.

I have taken this species in S. Wales, Wiltshire, and Devonshire. According to Haliday, it is rare in Ireland.

2. *Phænocarpa punctigera*, Hal.

Alysia punctigera, Hal., Ent. Mag., v., 238, ♀; pl. xvii, f. 27 (forewing), f. 30 (hindwing).

Fusco-castaneous with the head black, shining; mandibles and palpi rufous. Antennæ hardly as long as the body, pubescent, blackish, with the two basal joints rufous, 4th joint hardly elongate. Mesothoracic sutures incomplete; a punctiform fovea before the scutellum; furrow of the mesopleuræ finely traced, crenulate. Wings obscure; squamula rufous; stigma pale fuscous, oblong; radial areolet cultriform; 2nd abscissa curved at the base, hardly longer than the 1st intercubital nervure; 3rd abscissa straight; pobrachial areolet much longer than the præbrachial, being pro-

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duced in form of an obtuse lobe; 2nd discoidal areolet small, nearly obsolete owing to the shortness of the two transverse nervures; anal nervure interstitial; pobrachial areolet of the hindwings not half as long as the præbrachial; radial areolet almost bisected by an accessory transverse nervure. Legs rufous. First abdominal segment subbicarinate, reddish castaneous. Terebra as long as ⅔ of the abdomen. ♂ unknown. Length, 1½; wings, 2¾ lin.

One specimen only was taken by Haliday in north Ireland, and given by him to Curtis; it is therefore probably now in Australia.

3. *Phænocarpa tabida*, Nees, (Pl. XII., fig. 3, ♀).

Alysia tabida, Nees, Mon., i., 252, ♀; Hal., Ent. Mag., v., 237, ♂ ♀.

Second discoidal areolet obsolete; stigma much attenuated. ♀ Piceous, shining; head and posterior part of the abdomen blackish, 1st segment rufo-testaceous; mandibles and palpi rufous. Antennæ one-half longer than the body, fuscous with the 4–5 basal joints testaceous, 19–21-jointed, all the joints long, the 4th very long. Prothorax rufous; mesothorax castaneous or rufescent; sutures incomplete; metathorax sometimes testaceous, nearly smooth; a circular fovea before the scutellum. Wings hyaline; squamula rufous; nervures and stigma dull testaceous; radial areolet cultriform, attaining the tip of the wing; 2nd cubital areolet elongate, much narrowed towards the outer extremity; anal nervure interstitial; hindwings narrow, pobrachial areolet very small. Legs testaceous. First abdominal segment uneven, hardly rugulose, bicarinate, testaceous, the following segments rufescent, becoming gradually darker to the apex, which is black. Terebra as long as ¾ of the abdomen. ♂ Similar; antennæ longer, 20–22-jointed. Length, 1; wings, 2½ lin.

Found very sparingly in Germany and England; I have taken a single example.

4. *Phænocarpa picinervis*, Hal.

Alysia picinervis, Hal., Ent. Mag., v., 233, ♂ ♀; pl. xvii, f. 29 (wing).

Transverse nervures bordered with brown. ♀ Shining black, with a bronzed tint. Face punctulate, subcarinate; mandibles and palpi rufous, the latter more obscure. Antennæ slender black,

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rufescent at the base beneath, longer than the body, 27-jointed. Mesothoracic sutures crenulate, complete, meeting in a curve posteriorly; between them is an impressed longitudinal line; metathorax rugulose, smoother towards the base. Wings fuscescent: squamula testaceous, nervures and stigma fuscous, the latter conspicuous, emitting the radial nervure from its posterior half; radial areolet cultriform, reaching the tip of the wing; 2nd cubital areolet elongate, very slightly narrowed externally; 2nd abscissa twice as long as the 1st intercubital nervure; 2nd intercubital nervure more distinctly clouded with brown than the other nervures; pobrachial areolet of the hindwings very small. Legs dull rufous. Abdomen depressed; 1st segment rather long, twice as wide at the extremity as at the base, finely striolate. Terebra, measured from the base, as long as the abdomen. ♂ Similar; antennæ one-half longer than the body, or still longer, 30–32-jointed. Length, 1½–1¾; wings, 3-4 lin.

Rather common in damp shady places, in England and Ireland; I have often captured it.

5. *Phænocarpa ruficeps*, Nees.

Bassus ruficeps, Nees, Mag. Ges. Berl., 1814, p. 205.
Alysia ruficeps, Nees, Mon., i., 246; Hal., Ent. Mag., v., 233, ♂ ♀; pl. xvii, f. 16 (wing); Bouché, Naturg, 1834, p. 147.
Var. *Bassus testaceus*, Nees, Mag. Ges. Berl., 1814, p. 206.
A. testacea, Nees, Mon., i., 246 ♂.
A. gracilis and *pallida*, Cur., B. E., 141.
A. oculator, Ratz., Ichn. d. Först., ii., 71.

Metathorax transversely subcarinate near the extremity; variable, head generally rufous, body black, or (in var. 3) body mostly testaceous; stigma rather stout, oval. ♀ Shining; stemmaticum black; face punctulate. Antennæ longer than the body, 22–27-jointed, two basal joints rufous, 4th very long. Mesothoracic sutures punctate anteriorly, less distinct behind, converging to a deep fovea before the scutellum; metathorax finely rugulose, smooth near the base, sometimes with a medial area more or less distinct. Wings hyaline; squamula dull rufous; nervures and stigma fuscous, the latter determinately rounded at each end, stouter than in the allied spp. *picinervis* and *conspurcator* (Nos. 4, 9); pobrachial areolet of the hindwings longer. Legs rufous or testaceous; tips of the tarsi obscure. Abdomen somewhat piceous, subcompressed; 1st segment obconic, striolate. Terebra as long as

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the abdomen, the valves ciliated. ♂ Similar; antennæ much longer than the body, 25–32-jointed; head more broadly rufous than in the ♀. Length, 1½–2; wings, 2½–5 lin.

Var. 1. ♂ Wings with a yellowish tinge, the nervures decolorous towards the tip.

Var. 2. ♂ ♀. Red colour of the head more or less extended on the thorax.

Var. 3. ♂ ♀ Head pale rufous or testaceous; thorax and 1st abdominal segment the same, but more obscure; the rest of the abdomen fuscous or fuscescent. *Alysia testacea*, Nees. Two ♂s which I received from Scotland belong to this variety; their metathorax is almost smooth; the mesothoracic sutures and the mesopleuræ fuscous.

Var. 4. Head black. This variety is not uncommon; it must be recognised by the subcarinate metathorax, and the thickness of the stigma.

This very common species is known to be parasitic in the larvæ of *Anthomyia radicum*, L., *Lonchæa vaginalis*, Fall., and *Piophila casei*, L. Ratzeburg must have been mistaken in supposing that his *Alysia oculator* came from the caterpillar of *Tortrix rosana*, L.

6. *Phænocarpa Maria*, Hal.

Alysia Maria, Hal., Ent. Mag., v., 237, ♀

Second cubital areolet short (for the genus), the 2nd abscissa being not much longer than the 1st intercubital nervure. ♀ Shining black; mandibles rufescent. Antennæ rather shorter than the body, filiform, 19–21-jointed. Mesothoracic sutures complete, punctulate, meeting posteriorly in an acute angle; furrow of the mesopleuræ finely traced, crenulate; metathorax smooth and shining. Wings hyaline, somewhat whitish; squamula testaceous; nervures and stigma fuscous, the latter small, acute at both ends; 1st abscissa as long as the width of the stigma; radial areolet cultriform, attaining the tip of the wing; recurrent nervure interstitial; anal nervure subinterstitial; pobrachial areolet of the hind-wings ⅓ as long as the præbrachial. Legs fuscous; base of tibiæ rufescent. Abdomen attenuated at base and apex, wide in the middle; 1st segment a little longer than its apical breadth, faintly striolate, longitudinally elevated in the middle. Terebra as long as ½ of the abdomen. ♂ unknown. Length, 1¼; wings, 2½–3 lin.

England and Ireland; very rare. I captured a ♀ at Sandwich, and another in an osier-bed in Wiltshire.

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7. *Phænocarpa Galatea*, Hal.

Alysia Galatea, Hal., Ent. Mag., v., 238, ♀ pl. xvii, f. 17 (wing).

Second cubital areolet elongate; 2nd abscissa twice as long as the 1st intercubital nervure. ♀ Black or piceous, shining; mandibles rufescent. Antennæ hardly as long as the body, 21-jointed. Mesothoracic sutures incomplete, scarcely inchoate; a punctiform fovea before the scutellum; furrow of the mesopleuræ subobsolete, punctulate. Wings hyaline, whitish; squamula dull rufous; stigma pale fuscous, narrower than in the last species; 2nd cubital areolet with parallel sides; 1st cubital and 1st discoidal areolets indistinctly separated, the dividing nervure being nearly colourless; recurrent nervure interstitial; anal nervure not interstitial. Legs fuscous; tibiæ, trochanters, and apex of fore femora, rufescent. Terebra exserted, short. ♂ Unknown. Length, $1\frac{1}{6}$; wings, $2\frac{3}{4}$ lin.

Taken by Haliday once only on *Salix argentea*, growing on a sandy shore near Dublin; otherwise unknown.

8. *Phænocarpa Eugenia*, Hal. (Pl. XII., fig. 4, ♀.)

Alysia Eugenia, Hal., Ent. Mag., v., 234, ♂ ♀.

Rufo-testaceous, shining; stemmaticum, greater part of thorax, and first abdominal segment, fuscous. ♀ Antennæ testaceous, fuscescent towards the apex, twice as long as the body, 41–42-jointed, 4th joint a little longer than the 3rd, which is equal to the 5th. Prothorax and anterior part of the pleuræ rufo-testaceous; mesothoracic sutures complete, smooth, meeting before the scutellum in an acute angle, which is punctate; mesonotum impressed with some scattered punctures; scutellum convex, smooth; metathorax punctato-rugulose, smooth at the base. Wings hyaline with an obscure tinge; squamula rufous; nervures brown; stigma yellow, rather narrow, attenuated outwards; 2nd abscissa longer by a half than the first intercubital nervure; recurrent nervure interstitial; anal nervure not interstitial. Legs stout, rufous. Abdomen, after the 1st segment, rufo-testaceous; 1st segment black, as long as its apical width, striolate, elevated in the middle. Terebra rather longer than half the abdomen, the valves bristly, broader towards the extremity. ♂ Similar; antennæ 49-jointed; stigma fuscous. Length, 2; wings, 4 lin.

Var. ♀ Head almost entirely pitchy black; antennæ somewhat shorter; prothorax dark, except the pronotum; sides and apex of

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the abdomen fuscescent. Wings infumated; stigma fuscous. Length, 1½; wings, 3 lin. Taken once in the London district by Walker.

Extremely rare in north Ireland, according to Haliday. A single ♀ occurred in Cornwall, not far from my house. The size and colours render this species remarkable.

9. *Phænocarpa conspurcator*, Hal.

Alysia conspurcator, Hal., Ent. Mag., v., 236, ♂ ♀.

♀ Black; mandibles dull rufous; palpi paler. Antennæ somewhat longer than the body, 24–30-jointed, the two basal joints dull rufous. Mesothoracic sutures complete, finely punctate, meeting in an acute angle posteriorly; metathorax uneven, irregularly marked with a few elevated lines. Wings subhyaline; squamula rufescent; nervures and stigma fuscous, the latter very narrow, much attenuated outwards, where it is indeterminately confounded with the metacarp; 2nd cubital areolet slightly narrowed externally, the upper angle of its base often somewhat obtuse; anal nervure not interstitial; recurrent nervure interstitial. Legs dull rufous. First abdominal segment rather longer than its apical width, not shining, hardly rugulose, faintly carinate in the middle, the carina bifurcate near the base. ♂ Similar; antennæ longer and more slender, 32-jointed. Length, 1¼–2¼; wings, 3–5 lin.

This may be known from its nearest allies by the narrowness of the stigma. It is, perhaps, the commonest species of the genus, noticed in England, Ireland, France, Holland, and probably occurring throughout Europe. The ♀ may be often seen on dunghills, and the droppings of cattle, in the fields, seeking for the larvæ of *Scatophaga* and other flies.

10. *Phænocarpa pratellæ*, Curtis (Pl. XII., fig. 6, ♀).

Alysia pratellæ, Cur., B. E., 141; Hal., Ent. Mag., v., 235, ♀.

♀ Shining, pitchy black, the middle of the mesonotum sometimes rufescent. Head large, deep black; clypeus and mandibles rufous. Antennæ very slender, filiform, almost twice as long as the body, 33–35-jointed, blackish with the base rufous; 4th joint elongate. Mesothoracic sutures complete, smooth; metathorax very short, uneven, slightly rugulose. Wings hyaline; squamula testaceous; nervures fuscescent; stigma yellow, narrow, abruptly

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attenuated at the outer end; 2nd cubital areolet narrowed externally; recurrent nervure interstitial; anal nervure not interstitial. Legs testaceous. First abdominal segment not much narrowed at the base, one-half longer than broad, very finely striolate, sometimes rufous with the upper surface black. Terebra as long as the antennæ, and much longer than the body. ♂ Similar; antennæ 41-jointed; middle of the mesonotum (in my specimen), scutellum, and 1st abdominal segment rufous, the last blackish above. Length, 2; wings, 4½ lin.

Found amongst fungi, in England and Scotland, but rarely; I captured a pair in Groveley Wood, near Salisbury.

11. *Phænocarpa Nina*, Hal.

Alysia Nina, Hal., Ent. Mag., v., 236, ♀.

♀ Black; mandibles dull rufous. Antennæ as long as the body, 22-jointed, blackish, brownish beneath at the base. Mesothoracic sutures incomplete; discal fovea minute. Resembles *flavipes* (No. 13), and *conspurcator* (No. 9). Haliday gives no further description of this species, except:—Length, 1⅓; wings, 3 lin.

In a note in the Ent. Mag., v., 236, Haliday speaks of the three species *conspurcator*, *Nina*, and *flavipes* as requiring further examination, in order to separate them: we may conclude therefore that they are closely allied.

This species has only been taken in the Hebrides, by Haliday.

12. *Phænocarpa Eunice*, Hal.

Alysia Eunice, Hal., Ent. Mag., v., 235, ♀.

♀ Black; face punctulate; eyes slightly pubescent; mandibles rufous; palpi dusky. Antennæ as long as the body, brown at the base underneath, 25-jointed, 4th joint not elongate, 3rd a little longer than the 5th. Mesothoracic sutures inchoate; a short fovea before the scutellum. Wings infumated; squamula pale testaceous; stigma narrow; pobrachial areolet of the hindwings very small. Legs dull rufous. Terebra longer than the abdomen.

The above is Haliday's description, to which I add the diagnosis of an insect which I regard as the ♂, although in such a case there can be no certainty. Black; antennæ almost twice as long as the body, 30-jointed, fuscous, with the two basal joints testaceous. Mesothoracic sutures inchoate; a shallow circular fovea before the

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scutellum. Wings infumated; stigma narrow, etc., as in the ♀. Length, 2; wings, 4½ lin.

The ♀ was found rarely in Ireland by Haliday; I captured the ♂ near Salisbury.

13. *Phænocarpa flavipes*, Hal.

Alysia flavipes, Hal., Ent. Mag., v., 236, ♀.

♀ Pitchy black, shining; clypeus and mandibles rufous; palpi yellowish. Antennæ longer than the body, with the first 9 or 10 joints testaceous, 29–32-jointed. Mesothoracic sutures very faint or effaced posteriorly; a fovea before the scutellum situated in a bilobed rufous spot; metathorax uneven, shining. Wings hyaline; squamula yellowish; nervures and stigma fusco-testaceous, the latter distinct, cutting off the greater part of the 1st abscissa; 2nd cubital areolet narrowed externally; recurrent and anal nervures interstitial. Legs flavo-testaceous. Abdomen depressed; 1st segment a little longer than its apical breadth, not much narrowed towards the base, faintly striolate; 2nd segment sometimes with a transverse yellowish band at the base. Terebra as long as ⅔ of the abdomen. ♂ Similar; antennæ twice as long as the body, 30-jointed in my specimen; stigma much attenuated outwards, confounded with the metacarp; 1st abscissa short, but visible. Length, 1¼–1¾; wing, 2¾–3¾ lin.

Noticed in Ireland, England, and Holland; I took the ♂ at Bugbrooke near Northampton.

14. *Phænocarpa livida*, Hal.

Alysia livida, Hal., Ent. Mag., v., 237, ♂♀.

Abdomen, after the 1st segment, castaneous red or rufotestaceous. ♀ Pitchy black; oral parts rufous. Antennæ almost twice as long as the body, 27–28-jointed, blackish with the 3 or 4 basal joints testaceous; 4th joint not elongate, 3rd and 5th subequal. Prothorax testaceous; mesothoracic sutures inchoate; an oval fovea before the scutellum; metathorax dull, finely punctato-rugulose. Wings hyaline; squamula yellowish; nervures and stigma pale fuscous or testaceous, the latter narrow, attenuated outwards and confounded with the metacarp; 2nd cubital areolet narrowed towards the extremity; recurrent nervure interstitial; anal nervure almost interstitial; pobrachial areolet of the hindwings obsolete. Legs yellowish. Abdomen depressed; 1st segment blackish, dull, very finely punctato-rugulose. Terebra as

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long as ⅓ of the abdomen. ♂ Similar; antennæ three times as long as the body, 31-jointed; a bilobed rufous patch on the mesonotum (in my specimen); abdomen, after the 1st segment, testaceous with the apical segments infuscated. Length, 1–1½; wings, 2½–3 lin.

Rare in England and Ireland, according to Haliday; I possess a ♂ from the New Forest, and a ♀ captured near Salisbury.

(*To be continued.*)

Explanation of Plates XI. & XII.

PLATE XI.

Fig. 1. *Panerema inops*, Först. ♀
1 *a*. Abdomen viewed sideways.
1 *b*. Wings.

2. *Trachyusa Aurora*, Hal. ♂

3. *Allæa contracta*, Hal. ♀.
3 *a*. Male.
3 *b*. Wings of ♂.

4. *Alysia manducator*, Panz. ♀.
4 *a*. Antenna (after Curtis).
4 *b*. Mandible.
4 *c*. Abdomen viewed sideways.

PLATE XII.

Fig. 1. *Alysia tipulæ*, Scop. ♀.
2. *Idiasta maritima*, Hal. ♂.
3. *Phænocarpa tabida*, Nees, ♀.
4. *Phænocarpa Eugenia*, Hal. ♀.
4 *a*. Wing.
5. Wing of *Phænocarpa pullata*, Hal.
6. *Phænocarpa pratellæ*, Hal. ♀.

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XXII. *Catalogue of the* Pterophoridæ, Tortricidæ, *and* Tineidæ *of the Madeira Islands, with notes and descriptions of new species.* By the Right Honble. Lord Walsingham, M.A., LL.D., F.R.S.

[Read Oct. 3rd, 1894.]

A small collection of micro-lepidoptera made by the late T. Vernon Wollaston in Madeira, has been submitted to me by Mr. Bethune-Baker, together with some drawings by the late Professor Westwood of the types described by Wollaston and Stainton now in the British Museum. The specimens, unfortunately, are not in good condition, and the majority of the species have been already dealt with in two papers published by those authors [Wollaston, T. V., "Brief Diagnostic Characters of Undescribed Madeiran Insects," Ann. and Mag. N.H. (3 s.), I., 113—124; London, 1858. Stainton, H. T., "Notes on Lepidoptera collected in Madeira by T. V. Wollaston, Esq., with Descriptions of some New Species," Ann. and Mag. N.H. (3 s.), III., 211—214; London, 1859].

Such as are new are described below.

The opportunity seems to be favourable for compiling a complete list of the species known to occur in the Madeiras, which will, perhaps, form a useful parallel to the catalogues of micro-lepidoptera of the Canaries, lately published by Dr. Rebel [Rebel, H., "Beitrag zur Micro-lepidopterenfauna des canarischen Archipels," Ann. K. K. Hofmus. VII., Heft., 3, 241—284, Taf. XVII., Wien, 1892. "Zur Lepidopterenfauna der Canaren," Ann. K. K. Hofmus. IX., Heft. 1, 1—96, Taf. I., Wien, 1894].

Mrs. Holt White has lately published a catalogue of the lepidoptera of Teneriffe [White, A. E. Holt, edited by White, R. Holt, "The Butterflies and Moths of Teneriffe," pp. i.—xii. and 1—107, Pl. I.—IV.; London, 1894], which, though dealing specially with the larger lepidoptera, gives lists of the few micros known to occur in that island.

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Mrs. Wollaston's collections from St. Helena (also in the British Museum), of which descriptions were published by herself and the late Francis Walker [Walker, F., in Meliss' Saint Helena; London, 1875. Wollaston, Mrs. T. V., "Notes on the Lepidoptera of St. Helena, with Descriptions of New Species," Ann. and Mag., N.H. (5 s.), III.; London, 1879: this was republished in pamphlet form], are also important contributions to the study of the subject as connected with these groups of Atlantic islands which lie nearest to the African coast.

The present paper shows that the genus *Blastobasis* and its allies are more than proportionately represented in the Madeiras, and the line of their distribution over the European and American continents is thus connected and emphasized. The genera represented are, for the most part, common to both Europe and America, but the majority of the species recognized are European. One notable exception may be found in *Cosmopteryx pulcherrimella*, Chamb., hitherto recorded only from the United States, this has been very carefully compared with American specimens in my collection.

I have only to express my thanks to Mr. Bethune-Baker for kindly supplying me with so much interesting material, by which he has reinspired me with the hope of some day making a more complete and representative collection either personally or by deputy, in the Madeiran group of islands which I have long been anxious to visit.

By the list given it will be seen that sixty-six species of micro-lepidoptera are now known to occur in the Madeiras (four are not described); of these, thirty are peculiar to these islands, twelve are common to the Madeiras and Canaries (of which two do not occur elsewhere), and one extends its range only to North Africa. One species is peculiar to the Madeiras and to the United States. Thirty-two species occur in Europe, and of these, nine extend to the Canaries, thirteen to North America, and four to North Africa.

Over thirty species are added to the list, one new genus, seven new species, and two new varieties being here described.

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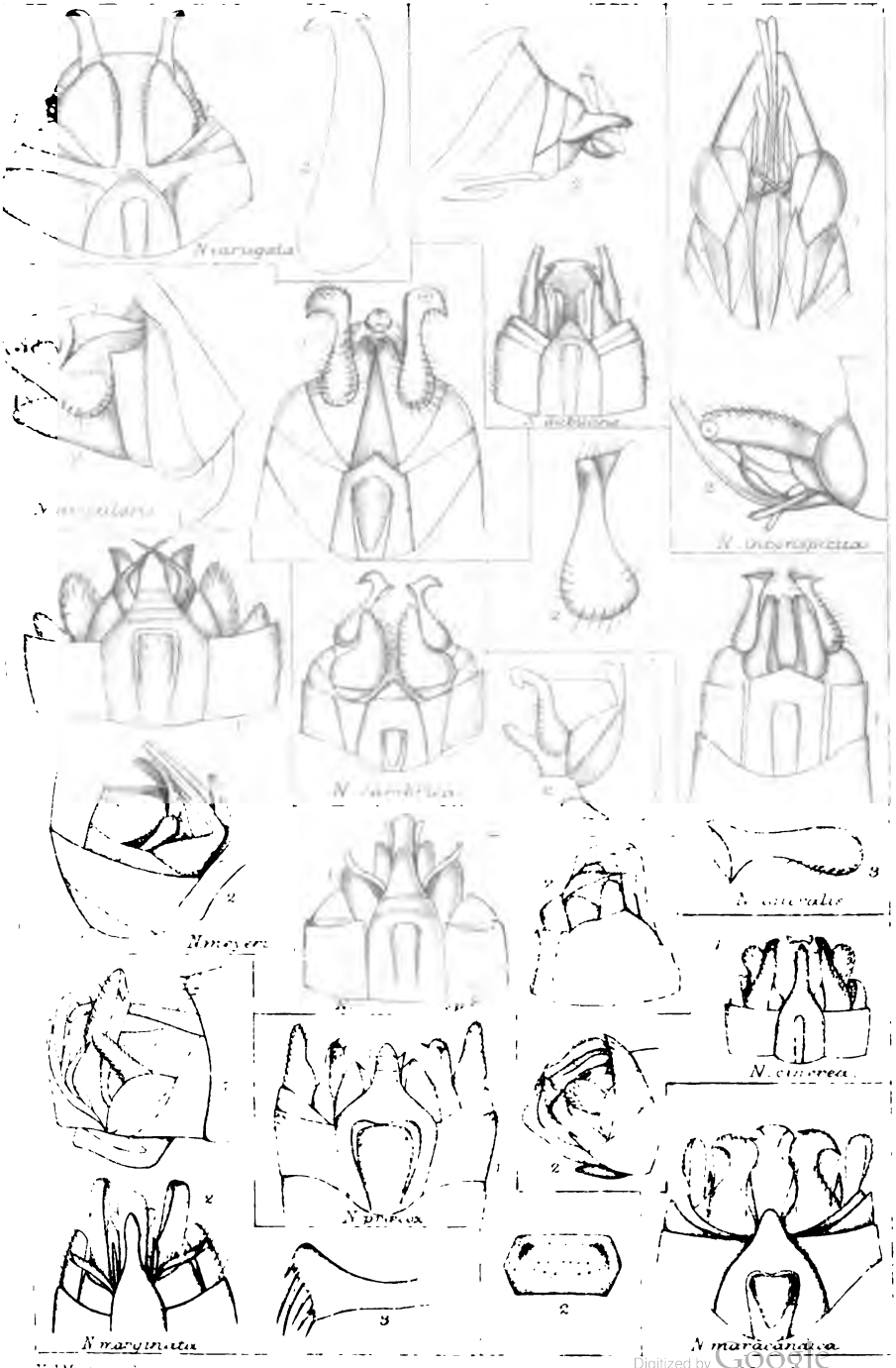

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Nemognathe

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		Canarias.	Europe.	N. America.	N. Africa.	Frequency in Madeira.
	PTEROPHORIDÆ.					
1.	Oxyptilus, sp.	—	—	—	—	1
2.	Platyptilia acanthodactyla, Hb.	—	[illegible]	[illegible]	—	—
3.	Alucita monodactyla, L.	[illegible]	[illegible]	[illegible]	—	—
	TORTRICIDÆ.					
	TORTRICINÆ.					
4.	Tortrix subcostana, Stn.	—	—	—	—	2
5.	,, retiferana, Stn.	—	—	—	—	3
6.	,, subjunctana, Wlstn.	—	—	—	—	4
7.	,, reticulata, Stn.	—	—	—	—	5
	CONCHYLIDINÆ.					
8.	Carposina atlanticella, Rbl.	—	—	—	—	6
	GRAPHOLITHINÆ.					
9.	Bactra lanceolana, Hb.	—	3	3	[illegible]	—
10.	Pædisca carduana, Gn.	—	4	—	—	—
11.	Grapholitha maderæ, Wlstn.	2	—	—	—	—
12.	Carpocapsa grossana, Hw.	—	5	—	—	—
13.	,, splendana, Hb.	—	6	—	—	—
14.	Steganoptycha signatana, Dgl.	—	7	—	—	—
15.	,, sp.	—	—	—	—	7
	TINEIDÆ.					
	TINEINÆ.					
16.	Trichophaga abruptella, Wlstn.	3 [illegible]	—	—	2	—
17.	Tinea pellionella, L.	4	5	4	—	—
18.	,, nigripunctella, Hw.	—	9	—	—	—
19.	,, irrorella, Wlstn.	—	—	—	—	4
20.	,, sp.	—	—	—	—	9
21.	Tineola biselliella, Humm.	—	10	5	3	—
22.	,, allutella, Rbl.	5	—	—	—	—
23.	Oenophila V-flavum, Hw.	—	[illegible]	—	—	—
24.	Bedellia somnulentella, Z.	—	12	6	—	—
	HYPONOMEUTINÆ.					
25.	Hyponomeuta bakeri, Wlsm.	—	—	—	—	10
	PLUTELLINÆ.					
26.	Plutella cruciferarum, Z.	6	13	7	4	—
	GELECHIANÆ.					
27.	Lita pulchra, Wlstn.	—	—	—	—	[illegible]
28.	,, submissella, Stn.	—	14	—	—	—
29.	,, ocellatella, Stn.	—	15	—	—	—
30.	,, portosanctana, Stn.	—	—	—	—	12
31.	Bryotropha domestica, Hw.	—	16	—	—	—
32.	Sitotroga cerealella, Oliv.	7	[illegible]	4	—	—
33.	Anacampsis albipalpella, H.S.	—	14	—	—	—
34.	,, elachistella, Stn.	—	—	—	—	13
35.	,, wollastoni, Wlsm.	—	—	—	—	14
	GLYPHIPTERYGINÆ.					
36.	Choreutis bjerkandrella, Thnb.	8	19	9	—	—
37.	Simaethis nemorana, Hb.	9	20	—	—	—
38.	,, oxyacanthella, L.	—	21	—	—	—
39.	Glyphipteryx, sp.	—	—	—	—	15

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		Canaries.	Europe.	N. America.	N. Africa.	Peculiar to Madeira.
	DEPRESSARIANÆ.					
40.	Depressaria conciliatella, Rbl.	10	22	...	...	—
41.	,, applana, F.	...	23	10	...	—
42.	Siganorosis heracliana, D.G.	...	24	11	...	—
	ŒCOPHORINÆ.					
43.	Œcophora pseudospretella, Stn.	...	25	12	...	—
	BLASTOBASINÆ.					
44.	Endrosis lacteella, Schiff.	...	26	13	...	...
45.	Blastobasis lavernella, Wlsm.	...	...	...	...	*16*
46.	,, decolorella, Wlstn.	...	...	...	...	17
47.	,, fuscomaculella, Rag....	11	27	...	...	...
48.	,, desertarum, Wlstn.	...	...	...	...	*18*
48A.	,, desertarum + radiata, Wlsm. ...	...	...	..	...	18A
49.	,, lignea, Wlsm.	...	...	...	...	19
49A.	,, lignea + adustella, Wlsm.	...	...	...	...	19A
50.	,, ochreopalpella, Wlstn.	...	...	...	...	20
51.	,, marmorosella, Wlstn	...	...	...	...	21
52.	,, nigromaculata, Wlstn.	...	...	...	...	22
53.	,, aurantiaca, Wlstn.	...	...	...	...	23
54.	Epistetus divisus, Wlsm.	...	...	...	...	24
55.	,, pica, Wlsm.	...	...	...	...	25
56.	Hypatima fasciata, Stn.	...	...	...	...	26
	LAVERNINÆ.					
57.	Laverna vittata, Wlstn.	...	...	...	...	27
58.	,, rebeli, Wlsm.	...	...	...	..	28
59.	Chauliodus daucellus, Peyr.	...	28	...	...	...
60.	Asychna insularis, Wlstn....	...	...	...	...	29
	COSMOPTERYGINÆ.					
61.	Cosmopteryx pulcherrimella, Chamb.	...	...	14	...	...
	GRACILARIANÆ.					
62.	Gracilaria staintoni, Wlstn.	...	...	...	...	30
63.	,, roscipennella, Hb.	12	29	...	...	...
64.	,, scalariella, Z.	...	30	...	...	...
65.	Lithocolletis messaniella, Z.	...	31	...	5	...
	LYONETIANÆ.					
66.	Phyllobrostis daphneella, Stgr.	...	32	...	...	...
66.		12	32	14	5	30

PTEROPHORIDÆ.

Oxyptilus, Z.

Oxyptilus, sp.

Madeira; one specimen.

Platyptilia, Hb.

Platyptilia acanthodactyla, Hb.

Pterophorus acanthodactylus, Stn., Ann. and Mag. N. H. (3 s.), III., 214 (1859).[1]

Madeira;[1] Funchal, eight specimens (Baker).

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ALUCITA, L.

Alucita monodactyla, L.

Pterophorus pterodactylus, Stn., Ann. and Mag. N. H. (3 s.), III., 214 (1859).[1]

Pterophorus monodactylus, Rbl., Ann. K. K. Hofmus. VII., 263, 282 (1892).

Madeira;[1] five specimens (Baker).

TORTRICIDÆ.

TORTRICINÆ.

TORTRIX, L.

Tortrix subcostana, Stn.

Tortrix subcostana, Stn., Ann. and Mag. N. H. (3 s.), III., 211 (1859);[1] Wkr. Cat. Lp. Ins. B. M., XXVIII., 326 (1863).

Madeira;[1] San Antonio da Serra, five specimens (Baker).

This species is mentioned by Dr. Rebel as occurring in the Canary Islands [Ann. K. K. Hofmus. IX., 16, 81–82 (1894)] on the evidence of specimens received by me from Teneriffe, collected by Mr. Leech in April, 1885, but a careful comparison leads me to regard these as distinct from the true Madeiran type. They are somewhat smaller, and have invariably a strong indentation on the inner side of the transverse fascia above the middle of the wing which I am unable to find in any specimens from Madeira; moreover, in the absence of a costal fold in the ♂, it cannot be rightly placed in the genus *Cacoecia*.

Tortrix retiferana, Stn.

Tortrix retiferana, Stn., Ann. and Mag. N. H. (3 s.) III., 211–12 (1859);[1] Wkr. Cat. Lp. Ins. B. M. XXVIII., 326 (1863).

Madeira;[1] The Mount, five specimens (Baker).

Tortrix subjunctana, Wlstn.

Tortrix subjunctana, Wlstn., Ann. and Mag. N. H. (3 s.), I., 120 (1858);[1] Wkr. Cat. Lp. Ins. B. M., XXX., 985 (1864).

Madeira.[1]

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Tortrix (?) *reticulata*, Stn.

Tortrix (?) *reticulata*, Stn., Ann and Mag. N. H. (3 s.), III., 211 (1859);[1] Wkr. Cat. Lp. Ins. B. M., XXVIII., 326 (1863).

Madeira;[1] San Antonio da Serra, one specimen (Baker).

CONCHYLIDINÆ.

CARPOSINA, H.S.

Carposina atlanticella, Rbl.

Carposina atlanticella, Rbl., Ann. K. K. Hofmus. IX., 92 (1894).

San Antonio da Serra; three specimens (Baker). Madeira, May; six specimens. (Leech, Mus. Wlsm.)

GRAPHOLITHINÆ.

BACTRA, Stph.

Bactra lanceolana, Hb.

San Antonio da Serra; four specimens.

PÆDISCA, Ld.

Pædisca carduana, Gn.

Madeira; three specimens (Baker). Mr. Leech also met with this in Madeira in May.

GRAPHOLITHA, Tr.

Grapholitha maderæ, Wlstn.

Ephippiphora maderæ, Wlstn., Ann. and Mag. N. H. (3 s.), I., 120 (1858).[1]

Grapholita maderæ, Wkr. Cat. Lp. Ins. B. M., XXX., 990 (1864).[2]

Grapholitha maderæ, Rbl., Ann. K. K. Hofmus. IX., 17, 87–88 (1894).[3]

Madeira;[1] Funchal and The Mount, eleven specimens (Baker). Canaries.[3] I have specimens taken by Mr. Leech at Madeira in April, and at Teneriffe in May.

CARPOCAPSA, Tr.

Carpocapsa grossana, Hw.

Madeira; one specimen.

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Carpocapsa splendana, Hb.

Madeira; two specimens.

STEGANOPTYCHA, Stph.

Steganoptycha signatana, Dgl.

Madeira; The Mount, one specimen.

Steganoptycha, sp.

Madeira; one specimen.

TINEIDÆ.

TINEINÆ.

TRICHOPHAGA, Rag.

Trichophaga abruptella, Wlstn.

N. syn. = *Tinea bipartitella*, Rag.

Tinea abruptella, Wlstn., Ann. and Mag. N. H. (3 s.), I., 120 (1858);[1] Wkr., Cat. Lp. Ins., B. M., XXX., 1003 (1864).

Tinea bipartitella, Rag. Bull. Soc. Ent. Fr., 1892, lxxxiii.

Tinea tapetzella, Rbl., Ann. K. K. Hofmus. VII., 268–9, 283 (1893): IX., 17 (1894).

Trichophaga bipartitella, Rag. Ann. Soc. Ent. Fr. LXIII., 122–4 (1894).

Porto Santo.[1]

The synonymy is verified by comparison with Ragonot's type from Tunis; I have also a specimen from Egypt.

This species differs from *tapetzella*, with which Dr. Rebel appears to have wrongly confounded it, in the straighter outer edge of the dark portion of the wing, which is not produced along the costal margin. I have seen no European specimen possessing this character.

TINEA, L.

Tinea pellionella, L.

Tinea pellionella, Stn., Ann. and Mag. N. H. (3 s.), III., 212 (1859);[1] Rbl., Ann. K. K. Hofmus. VII., 283 (1892): IX., 17 (1894).

Madeira;[1] nine specimens (Baker).

Tinea nigripunctella, Hw.

Tinea nigripunctella, Wlsm., Ent. Mo. Mag., XXX., 50 (1894)[1].

Madeira;[1] four specimens (Baker).

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Tinea irrorella, Wlstn.

Tinea irrorella, Wlstn., Ann. and Mag. N. H. (3 s.), I., 120 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 1002 (1864).

Madeira.[1]

Tinea, sp.

Madeira; four specimens.

These are closely allied to *irrorella*, Wlstn., but differ in having smaller and more scattered markings and no apical spot; they are not in good enough condition for description.

TINEOLA, H.S.

Tineola biselliella, Humm.

Madeira; four specimens.

Tineola allutella, Rbl.

Tineola allutella, Rbl., Ann. K. K. Hofmus. VI., 270–71, Pl. VII., 3 (1892).[1]

Canaries.[1] Madeira; one specimen (Baker).

ŒNOPHILA, Stph.

Œnophila V-flavum, Hw.

Oinophila flava, Stn., Ann. and Mag. N. H. (3 s.), III., 214 (1859).[1]

Madeira;[1] four specimens (Baker).

BEDELLIA, Stn.

Bedellia somnulentella, Z.

Bedellia somnulentella, Stn., Ann. and Mag. N. H. (3 s.), III., 214 (1859).[1]

Madeira.[1]

HYPONOMEUTINÆ.

HYPONOMEUTA, Z.

Hyponomeuta bakeri, Wlsm., sp. n.

Antennæ slightly serrate in ♂; brownish cinereous. *Palpi* porrect, somewhat recurved, cinereous. *Head* greyish fuscous, posteriorly tinged with ochreous, face whitish. *Thorax* olivaceous.

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Forewings rather shining, olive-brown, with a distinct white streak running from the base to above the anal angle, and containing a blackish patch beyond its middle; this streak is narrow at the base, and slightly widened outwards, ending abruptly, but connected in one specimen by a few whitish scales to the pale base of the cilia; before the apex the costal margin is narrowly whitish, and the basal half of the cilia around the apex, to a point opposite to the end of the white streak coming from the base, is also whitish, the outer half of the cilia being brownish-grey. *Hindwings* brownish-grey, cilia scarcely paler, with a slight shade running through them near their base. *Abdomen* brownish-grey. *Legs* greyish-cinereous. *Exp. al.*, 20 mm.

Type. ♂ ♀. Mus. Wlsm.

Hab. Madeira; San Antonio da Serra, five specimens.

This species is nearly allied to *egregiellus*, Dp., but the points of difference appear to be constant, the black spot in the white "length-streak" is smaller in *egregiellus*, and does not fill up the whole width of the streak, the colour of *egregiellus* is much greyer, less brown, there is no conspicuous white shade along the base of the cilia, and, moreover, the palpi are shorter and more dependent.

PLUTELLINÆ.

Plutella, Schrk.

Plutella cruciferarum, Z.

Plutella cruciferarum, Stn., Ann. and Mag. N. H. (3 s.), III., 212 (1859);[1] Rbl., Ann., K. K. Hofmus. VII., 283 (1892): IX., 167 (1894).

Madeira;[1] Funchal, and San Antonio da Serra, four specimens (Baker).

GELECHIANÆ.

Lita, Tr.

Lita pulchra, Wlstn.

Gelechia pulchra, Wlstn., Ann. and Mag. N. H. (3 s.), I., 121 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXIX., 627 (1864).

Deserta Grande.[1]

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Lita submissella, Stn.

Gelechia submissella, Stn., Ann. and Mag. N. H. (3 s.), III., 212–13 (1859);[1] Wkr., Cat. Lp. Ins. B. M., XXIX., 628 (1864).

Porto Santo.[1]

Lita ocellatella, Stn.

Gelechia ocellatella, Stn., Ent. Ann. 1859. 151–2 (14. XII. 1858):[1] Ann. and Mag. N. H. (3 s.), III., 212 (1859);[2] Wkr., Cat. Lp. Ins. B. M., XXIX., 628 (1864).

Porto Santo.[1, 2]

Lita portosanctana, Stn.

Gelechia portosanctana, Stn., Ann. and Mag. N. H. (3 s.), III., 212 (1859);[1] Wkr., Cat. Lp. Ins. B. M., XXIX., 628 (1864).

Porto Santo.[1]

BRYOTROPHA, Hein.

Bryotropha domestica, Hw.

Madeira; one specimen.

SITOTROGA, Hein.

Sitotroga cerealella, Oliv.

Madeira; Funchal, four specimens.

ANACAMPSIS, Crt.

Anacampsis albipalpella, H.S.

= *Gelechia anthyllidella*, Stn., Ann. and Mag. N. H. (3 s.), III., 213 (1859).[1]

Madeira;[1] one specimen (Baker).

Anacampsis (?) *elachistella*, Stn.

Gelechia elachistella, Stn., Ann. and Mag. N. H. (3 s.), III., 213 (1859);[1] Wkr., Cat. Lp. Ins. B. M., XXIX., 628 (1864).

Northern Deserta.[1]

The type is unset, but it is apparently an *Anacampsis*.

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Anacampsis wollastoni, Wlsm., sp. n.

Antennæ whitish. *Palpi* white, the second joint shaded with brown externally to near its apex, which is slightly tufted. *Head* smooth, shining white. *Thorax* whitish, tegulæ brown, with a creamy white streak along their inner edge. *Forewings* narrow, elongate, acuminate; brown, with a narrow creamy-white streak along the dorsal margin extending to the apex and including the cilia, but interrupted beyond the anal angle by two oblique brown streaks, the first along the apical margin, the second, shorter, in the cilia; beneath the apex a slight darkish line in the base of the cilia around the apex is preceded by a faint indication of a pale, very oblique line, commencing at the anterior extremity of the costal cilia and terminating below the apex of the wing; but this is not observable in worn specimens. *Hindwings* shining, pale grey, cilia pale ochreous. *Abdomen* shining, greyish-ochreous. *Legs* greyish-ochreous. *Exp. al.*, 14–15 mm.

Type. ♂♂♂. Mus. Wlsm.

Hab. Madeira; seven specimens.

GLYPHIPTERYGINÆ.

Choreutis, Hb.

Choreutis bjerkandrella, Thnb.

Madeira; Funchal, three specimens.

Simaethis, Leach.

Simaethis nemorana, Hb.

Madeira; The Mount, seven specimens.

Simaethis oxyacanthella, L.

= *Simaëthis fabriciana*, Stn., Ann. and Mag. N. H. (3 s.), III., 210 (1859).[1]

Madeira.[1]

Glyphipteryx, Hb.

Glyphipteryx, sp.

Madeira; Funchal, one specimen.

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DEPRESSARIANÆ.

DEPRESSARIA, Hw.

Depressaria conciliatella, Rbl.

Depressaria conciliatella, Rbl., Ann. K. K. Hofmus. VII., 272–74, 283, Pl. XVII., 14 (1892).[1]

Sicily,[1] Canaries;[1] Madeira, Funchal, and The Mount, fourteen specimens (Baker).

If I am right in the identification, this appears to be an exceedingly variable species, a long series showing great variation in colour from pale stone-grey to fawn-brown, with intermediate mottled varieties, having much the appearance of *assimilella*, Tr.

Depressaria applana, F.

Madeira; one specimen.

I am unable to distinguish this specimen from the common English species, but the antennæ are somewhat broken towards their ends.

SIGANOROSIS, Wlgrn.

Siganorosis heracliana, D.G.

Madeira; one specimen.

ŒCOPHORINÆ.

ŒCOPHORA, Stn.

Œcophora pseudospretella, Stn.

Madeira; one specimen.

BLASTOBASINÆ.

ENDROSIS, Hb.

Endrosis lacteella, Schiff.

= *Endrosis fenestrella*, Stn., Ann. and Mag. N. H. (3 s.), III, 213 (1859).[1]

Madeira;[1] San Antonio da Serra, seven specimens (Baker).

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Blastobasis, Z.

Areins 3 and 4 of the hindwings coincident, 5 from the same point as 3+4.

Blastobasis lavernella, Wlsm., sp. n.

Antennæ notched in the ♂ above the basal joint; greyish, basal joint ochreous. *Palpi* ochreous, the outer side of the second joint shaded with greyish-brown along its lower half nearly to the apex, on the upper side paler than the apical joint. *Head and Thorax* ochreous, tegulæ shaded with greyish-brown. *Forewings* ochreous, mixed with reddish-ochreous mottlings, and shaded with patches of greyish-brown, forming two irregular oblique fasciaform bands on the basal half of the wing and two waved streaks on the apical half; the first oblique band passes outwards to the costal margin before the middle from about the inner third of the fold; the second, forming a patch on the dorsal margin at one-third, runs parallel with the first to the costa about the middle, or extending slightly beyond it, the two are sometimes connected by a slight cross-streak on the disc; at the commencement of the costal cilia a greyish-brown quadrangular spot, narrowly produced outwards beyond the cell, reverts to the anal angle joining a spot of the same colour, which is produced upwards and inwards to the end of the cell; between this and the outer of the two oblique fasciæ lies a small spot of the same colour immediately above the fold at two-thirds from the base; cilia greyish-ochreous with a greyish-brown line running around the apex and apical margin near their base, but dying out before reaching the anal angle; this is preceded by a faintly-indicated marginal line on the wing within it. *Hindwings* shining, pale stramineous; cilia pale ochreous. *Abdomen* shining, pale stramineous, the segments indicated by greyish lines. *Legs* shining, pale ochreous. *Exp. al.*, 15–16 mm.

Type. ♂. Mus. Wlsm.
Hab. Madeira; three specimens.

This species is apparently allied to *Blastobasis decolorella*, Wlstn., but has somewhat deeper colouring, with a different arrangement of its more pronounced markings, and has much the general appearance of *Laverna ochraceella*.

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Blastobasis decolorella, Wlstn.

Laverna (?) *decolorella,* Wlstn., Ann. and Mag. N. H. (3 s.), I., 122 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 885 (1864); Rbl., Ann. K. K. Hofmus. IX., 92–3 (1894).

Madeira;[1] Funchal, and San Antonio da Serra, eighteen specimens (Baker). Mr. Leech also took this species at Madeira in May.

This species is a true *Blastobasis;* its neuration is as follows:—

Forewings, 12 veins; 7 and 8 stalked, both to above apex. *Hindwings,* 7 veins; 3 and 4 coincident, 5 from the same point as 3+4, 6 and 7 separate and parallel.

It exhibits considerable variation in size, in colour, and in the distinctness or suffusion of the spots and markings. The drawing made by Westwood was evidently taken from one of the more reddish-ochreous specimens, whereas the more prevalent form appears to be whitish-ochreous or whitish-fawn-colour with brownish and umber spots and scales. The slender dark lines across the abdominal segments are persistent throughout the series, but these occur also in other species, and must not be too much relied on. A description of the well-marked paler forms may be useful.

Antennæ distinctly notched and finely ciliate in the ♂; basal joint enlarged, pectinate beneath; brownish-grey, whitish-fawn beneath. *Palpi* whitish-fawn, second joint externally brown except at its apex. *Head, face, and thorax* whitish-fawn. *Forewings* narrow, elongate, lanceolate towards the depressed apex; very pale fawn, slightly suffused with fawn-brown scales across the middle and at one-third of the fold; an umber patch on the middle of the dorsal margin, above which is an umber spot on the disc before the middle of the wing, followed by a second spot of the same colour below and beyond it; two umber spots at the end of the cell, the lower more conspicuous than the upper and almost parallel with it; these are followed by a sinuate brownish shade commencing on the costa in the beginning of the costal cilia and ending at the anal angle, much bowed outwards in the middle; towards the apex of the wing a few slight brownish dots and scales are scattered about the apex and apical margin; cilia very pale fawn. *Hindwings* shining, pale fawn-grey, cilia very pale ochreous. *Abdomen*

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pale greyish-fawn, each segment narrowly margined with blackish. *Legs* whitish-fawn, the anterior pair much shaded with umber-brown. *Exp. al.*, 17–22 mm.

In some specimens the umber dorsal patch is almost entirely obliterated, the markings fainter and more suffused, and the dots around the apex and apical margin coalescing and forming a brownish-grey line along the base of the cilia, which is reduplicated along their middle towards the anal angle.

Blastobasis fuscomaculella, Rag.

N. syn. = *seeboldiella*, Kreithn. = *marmorosella*, Rbl. (nec. Wlstn.).

Œcophora fuscomaculella, Rag., Bull. Soc. Ent. Fr., 1879, cxli.[1]

Œcophora seeboldiella. Kreithn., Sitzb. Z.-B. Ges. Wien, XXXI., 20–1 (1881).[2]

Blastobasis marmorosella, Rbl., Ann. K. K. Hofmus. VII., 276–78, 283, Pl. XVII., 6 (1892):[3] IX., 18, 90–1 (1894).

Portugal,[1] Spain,[2] Canaries.[3] Madeira (British Museum).

The types of *Œcophora marmorosella*, Wlstn., in the British Museum, show that this species has veins 5 and 3+4 of the hindwings distinctly stalked, whereas *Œcophora seeboldiella*, Kreithn., from Bilbao, which Dr. Rebel has identified with this species, has these veins arising from a point, and therein agreeing with a larger and wider-winged species in the British Museum, and with a single specimen in my own collection from the Canaries which was determined for me by Dr. Rebel as *marmorosella*.

The name *fuscomaculella* must stand for the larger form, and *marmorosella* for the smaller and narrower-winged species. I have seen the type of *fuscomaculella*, Rag., and consider it the same as *seeboldiella*, Kreithn., and *marmorosella*, Rbl. (nec. Wlstn.).

B-veins 3 and 4 of the hindwings coincident; 5 and 3+4 stalked.

Blastobasis desertarum, Wlstn.

N. syn. = *Pterolonche* (?) *maderensis*, Stn.

Coleophora desertarum, Wlstn., Ann. and Mag. N. H. (3 s.), I., 122 (1858).[1]

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Pterolonche (?) *maderensis*, Stn., Ann. and Mag. N. H. (3 s.), III., 213 (1859);[2] Wkr., Cat. Lp. Ins. B. M., XXIX., 666 (1864).[3]

Coleophora desertorum, Wkr., Cat. Lp. Ins. B. M., XXX., 879 (1864).[4]

Northern Deserta,[1,2] Porto Santo;[3] Funchal, nine specimens (Baker).

The specimens of *Coleophora desertarum* in the British Museum are small and somewhat more strongly marked varieties, but are evidently the same species as *maderensis*.

Blastobasis desertarum, Wlstn. + *radiata*, Wlsm., var. n.

Antennæ notched at the base in the ♂, basal joint enlarged, with a pecten; fawn-grey. *Palpi* porrect, the second joint projecting beyond the head and clothed with loose scales beneath towards the apex, apical joint short, not recurved; whitish. *Head and Thorax* whitish, the latter shaded with pale fawn-brown. *Forewings* whitish, a pale fawn-brown streak extending from the base immediately below the costal margin and gradually widening outwards to the end of the cell, whence it is continued to the apex, covering half of the outer portion of the wing, the costal margin above it being narrowly pale beyond the middle; a second pale fawn-brown streak from the middle of the base extends to the anal angle and along the base of the cilia nearly to the apex, but not extending beneath the fold, and having above the anal angle a small blackish dot opposite to a still smaller one at the lower margin of the upper streak; there is also an indication of a blackish dot near the outer end of the fold, and the pale intermediate spaces are slightly speckled with blackish scales; cilia fawn-grey. *Hindwings* shining, fawn-white; cilia pale whitish-ochreous. *Abdomen* whitish-ochreous, the segments indicated by slender dark cross-lines. *Legs* whitish-ochreous, hind tibiæ clothed with long loose hair-like scales. *Exp. al.*, 14 mm.

Type. ♂. Mus. Wlsm.

Hab. Madeira; Funchal, one specimen.

Blastobasis lignea, Wlsm., sp. n.

Antennæ pale greyish-fuscous; basal joint enlarged, tufted and notched in the male, pale cinereous. *Palpi* pale cinereous, shaded and mottled with greyish-fuscous externally. *Head and Thorax* pale cinereous, the latter shaded with greyish-fuscous. *Forewings* pale cinereous, much shaded and speckled with greyish-fuscous,

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with a slight purplish gloss; five small blackish spots (the first on the disc before the middle is sometimes connected with one on the middle of the fold below, and somewhat before it; a small one on the lower edge of the cell lies halfway between these and two parallel spots, the one above the other, at the outer end of the cell); around the apex and apical margin is a series of six or eight ill-defined greyish-fuscous spots along the base of the cilia which are greyish-cinereous, somewhat darker towards the apex. *Hind-wings* very pale cinereous with pale greyish-cinereous cilia. *Abdomen* missing. *Legs* pale cinereous, somewhat speckled and shaded with greyish-fuscous externally. *Exp. al.*, ♂ 14, ♀ 19 mm.

Type. ♂ ♂ ♀. Mus. Wlsm.
Hab. Madeira; sixteen specimens.

Blastobasis lignea, Wlsm. + *adustella*, Wlsm., n. var.

In a single specimen the darker shading is more conspicuous, and the two inner spots are merged in an angulated fascia, leaving the dorsal margin at one-third and tending obliquely outwards to the disc before the middle, where it is angulated back towards the costa from what should be the position of the upper spot; but, before reaching the costa, it is again bent upwards and slightly outwards to the margin.

Abdomen very pale cinereous, the segments marked by narrow greyish-fuscous transverse lines. *Exp. al.*, 19 mm.

Type. ♀. Mus. Wlsm.
Hab. Madeira; one specimen.

Intermediate varieties in which the fascia is slightly indicated appear to occur, but I have no specimens before me in condition for comparative description.

Blastobasis ochreopalpella, Wlstn.

Œcophora ochreopalpella, Wlstn., Ann. and Mag. N. H. (3 s.), I., 121 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 1029 (1864).

Madeira.[1]

Blastobasis marmorosella, Wlstn.

Œcophora marmorosella, Wlstn., Ann. and Mag. N. H. (3 s.), I., 128 (1858);[1] Wkr., Cat. Lp. Ins. B. M. XXX., 1028 (1864).

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Porto Santo,[1] Northern Deserta.[1]

Distinct from *seeboldiella,* Kreithn. See remarks under *fuscomaculella,* Rag. (ante p. 549).

Blastobasis nigromaculata, Wlstn.

Gelechia nigromaculata, Wlstn., Ann. and Mag. N. H. (3 s.), I., 121 (1858);[1] Wkr., Cat. Lp. Ins. B.M., XXIX., 627 (1864).

Madeira,[1] Southern Deserta;[1] Madeira, four specimens (Baker).

Blastobasis (?) *aurantiaca,* Wlstn.

Gracilaria (?) *aurantiaca,* Wlstn., Ann. and Mag. N. H. (3 s.), I., 122 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 854 (1864).

Madeira, summer of 1855.[1]

EPISTETUS, Wlsm., gen. nov.

(ἐπιστητός, capable of being scientifically known.)

TYPE, *Epistetus divisus,* Wlsm.

Antennæ, ♂, strongly bifasciculate (3); basal joint enlarged, with a pecten, second and third joints also enlarged, the base of the fourth joint attenuate. *Maxillary palpi* overlapping the base of the haustellum. *Labial palpi* with the second joint somewhat longer than the apical, scarcely tufted at the end beneath. *Ocelli* absent. *Head* somewhat crested above, face smooth. *Thorax* smooth. *Forewings* narrow, elongate, pointed, the apex scarcely depressed, anal angle obsolete. *Neuration,* 12 veins, 7 and 8 from a common stem, both to above apex. *Hindwings* as broad as the forewings, lanceolate, subovate, abdominal angle somewhat pronounced, cilia (1). *Neuration* 7 veins, 3 and 4 coincident, 5 from the same stem as 3+4, 6 and 7 separate. *Abdomen*, ♂, somewhat flattened and laterally dilated. *Legs* with hind tibiæ slightly clothed.

Epistetus divisus, Wlsm., sp. n.

Antennæ fuscous, basal joint brownish. *Palpi* brownish. *Head and Thorax* bronzy-brown; face shining, pale cinereous. *Forewings* shining, bronzy-brown, with a slightly-waved narrow whitish line or fascia across their middle, scarcely farther from the base on the dorsal than on the costal margin; beyond this line the outer half of the wing is slightly paler than the base, and shows a faint indication of a transverse darker spot at the end of the cell,

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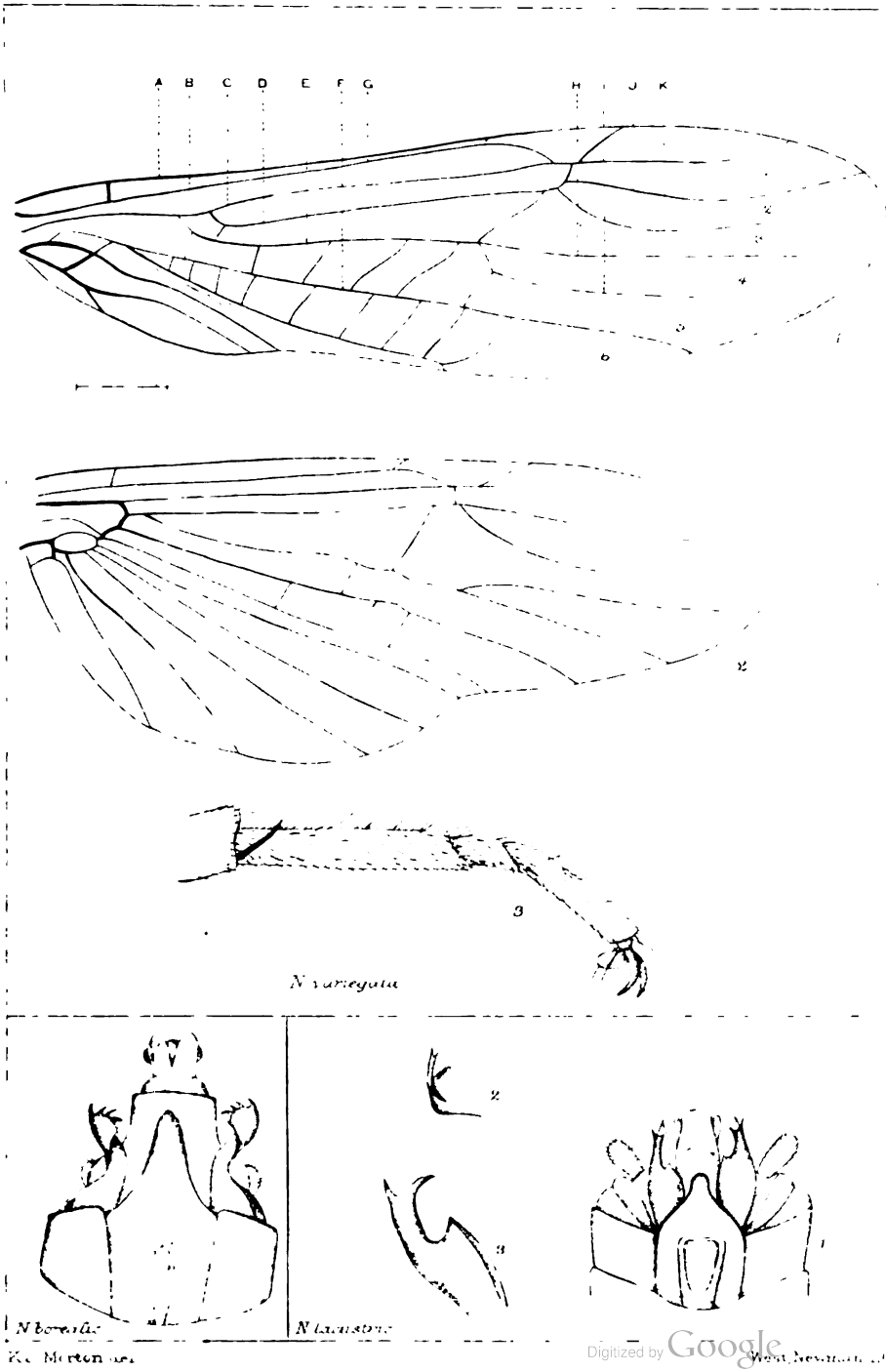

Nemouræ

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sometimes connected with a few scales of the same colour on the costal and dorsal margins, and giving the appearance of a dentate shade or fascia ; a few darkened spots around the apex are followed by paler scales at the base of the cilia which are bronzy-grey. *Hindwings and cilia* bronzy-grey. *Abdomen* bronzy-grey. *Legs* bronzy-brown, the spurs pale cinereous, tarsal joints spotted with pale cinereous. *Exp. al.*, 12–17 mm.

Type. ♂ ♀. Mus. Wlsm.
Hab. Madeira ; five specimens.

Epistetus (?) *pica*, Wlsm., sp. n.

Antennæ, ♀, with a pecten on the basal joint ; brownish-grey, basal joint white. *Palpi* white, shaded externally on the second joint with brown. *Head and face* white. *Thorax* white, a brownish-fuscous band across its anterior margin and a spot of the same colour posteriorly, tegulæ white. *Forewings* narrow, elongate ; shining white, with numerous brownish-fuscous patches and dots ; an elongate brownish-fuscous patch at the base of the costal margin reaches to the fold on its inner half ; this is followed before the middle of the wing by a similar costal patch tending obliquely outwards and narrowly confluent with a somewhat triangular dorsal patch of the same colour which reaches to the middle of the dorsal margin, thus forming an oblique fascia attenuated in the middle ; beyond the middle of the wing on the costal margin is a narrow elongate patch, beneath which are a few brownish-fuscous dots tending in the direction of a triangular dorsal patch beyond it a little before the anal angle ; a conspicuous costal patch lies before the apex and is followed by a series of small spots around the apex and apical margin to the anal angle ; an outwardly oblique narrow patch of the same colour lies near the base of the dorsal margin, reaching to the fold, and is continued narrowly along the margin to the base ; a single spot or dot lies on the lower edge of the discal cell above the outer end of the fold ; all these markings are more or less surrounded by pale ferruginous scales, but in some specimens these are scarcely apparent ; cilia grey, whitish towards the apex. *Hindwings* grey, with grey cilia. *Abdomen* grey. *Legs* brownish, the joints of the tibiæ and tarsi indicated by whitish spots. *Exp. al.*, 15–17 mm.

Type. ♀. Mus. Wlsm.
Hab. Madeira ; two specimens.

In the absence of the ♂ this species cannot be located with certainty.

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HYPATIMA, Hb.

Hypatima fasciata, Stn.

Gelechia fasciata, Stn., Ann. and Mag. N. H. (3 s.), III., 213 (1859);[1] Wkr., Cat. Lp. Ins. B. M., XXIX., 628 (1864).

Deserta Grande;[1] Madeira, Funchal, and The Mount, five specimens (Baker).

LAVERNINÆ.

LAVERNA, Crt.

Laverna vittata, Wlstn.

Laverna vittata, Wlstn., Ann. and Mag. N. H. (3 s.), I., 122 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 885 (1864).

Madeira.[1]

Laverna rebeli, Wlsm., sp. n.

Antennæ as long as the forewings; pale fawn. *Palpi* with second joint much longer than the apical, closely clothed and tufted beneath; fawn-whitish on their inner sides, externally clouded with umber-brown. *Head and face* stone-whitish. *Thorax* fawn-whitish. *Forewings* fawn-whitish, slightly tinted by shining steel-grey scales on the paler portions and much clouded on the outer two-thirds with umber-brown; a patch of raised dark umber-brown scales lies on the middle of the fold and extends obliquely outwards above it, forming the inner margin of a wide umber-brown dorsal patch; this patch and the other umber-brown shadings beyond it are sprinkled with scattered scales of a darker shade which are especially noticeable around the apex of the wing at the base of the cilia; there is also a small umber-brown shade at the extreme base of the costal margin; cilia pale fawn. *Hind-wings* fawn-grey, with paler cilia. *Legs* fawn-whitish, hind tarsal joints shaded with brownish and spotted with whitish externally. *Abdomen* missing. *Exp. al.*, 14–16 mm.

Type. ♂ ♀. Mus. Wlsm.
Hab. Madeira; three specimens.

CHAULIODUS, Tr.

Chauliodus daucellus, Peyr.

Madeira; five specimens.

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ASYCHNA, Stn.

Asychna insularis, Wlstn.

Asychna insularis, Wlstn., Ann. and Mag, N. H. (3 s.), I., 122 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 887 (1864).

Madeira.[1]

COSMOPTERYGINÆ.

COSMOPTERYX, Hb.

Cosmopteryx pulcherrimella, Chamb.

Madeira; nine specimens.

Hitherto only recorded from the United States.

GRACILARIANÆ.

GRACILARIA, Hw.

Gracilaria staintoni, Wlstn.

Gracilaria staintoni, Wlstn., Ann. and Mag. N. H. (3 s.), I., 121 (1858);[1] Wkr., Cat. Lp. Ins. B. M., XXX., 854 (1864).

Madeira;[1] The Mount, two specimens (Baker).

Gracilaria roscipennella, Hb.

Madeira; San Antonio da Serra, seventeen specimens.

Gracilaria scalariella, Z.

Madeira; twenty-one specimens.

LITHOCOLLETIS, Hb.

Lithocolletis messaniella, Z.

Madeira; nine specimens.

LYONETIANÆ.

PHYLLOBROSTIS, Stgr.

Phyllobrostis daphneella, Stgr.

Madeira; one specimen.

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XXIII. *Palæarctic Nemouræ.* By Kenneth J. Morton, F.E.S.

[Read Oct. 3rd, 1894.]

Plates XIII. and XIV.

At the present time the *Perlidæ*, and especially the smaller members of the family, occupy a prominent place amongst the less-known of European insects. Pictet's treatise ("Histoire Naturelle des Insectes Névroptères, Famille des Perlides, 1841"), now over fifty years old, may still be considered the standard of our knowledge of the family, and that work, in many respects of exceptional merit, naturally falls short of modern requirements as far as the separation of critical and closely allied species is concerned.

I have now collected these insects for nearly three years, and have, at the same time, made them the subject of more or less constant study during my limited leisure. The district in which I happen to reside has an exceptionally good representation of that aquatic insect life which belongs to running waters, and materials in *Perlidæ*, including most of the British species, were thus easily obtained. The results of an examination of these, in a fresh as well as a dry condition, have led me to the conclusion that the only reliable criterion for the separation of the species is in most cases to be found in the genitalia and accessory appendages of the ♂. These parts have been too much neglected by previous writers on *Perlidæ*, and in support of the conclusions I have come to regarding their value, I now offer the following notes on the species of the genus *Nemoura*, in which genus the appendages appear to be most highly specialized. These notes must be regarded as in all respects preliminary, but relating as they do to a neglected subject, it is hoped they may be of use. Monographic completeness is not yet possible, and has not been attempted.

At the outset it was not my intention to do more than try to make known the species inhabiting the British Isles. The expansion of the original idea is due to the

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co-operation of the following entomologists :—Mr. McLachlan kindly lent me all his Palæarctic *Nemouræ*, numbering several hundreds, from all parts of the region, and including the results of his own collecting in Savoy, Switzerland, Burgundy, Dauphiné, the Pyrénées Orientales, Belgium, etc., Eaton's in Portugal, Zeller's in Carinthia and elsewhere, and Fedchenko's in Turkestan; Dr. Fr. Ris, now of Rheinau, had the goodness to forward his whole collection of Swiss *Nemouræ*, an extensive series in perfect condition; Mr. King, of Glasgow, supported me with much additional British material; Professor Klapálek, of Prague, sent me many useful insects; and Dr. John Sahlberg forwarded a choice collection of boreal and arctic *Perlidæ*, containing between three and four hundred examples belonging to the Helsingfors Museum. I have thus had abundant material to work from; the apparently inadequate results are due to the small proportion of males and the fact that isolated females are in many cases practically indeterminable.

At an early stage of my studies the nomenclature was seen to be in a hopeless tangle. No clear conception existed with regard to the limits of the species; the same species was known by several names according to the interpretation put upon existing descriptions by different entomologists; examples of the same species might be seen doing duty as exponents of two or more species in the same collection, or the reverse condition might obtain, two good species standing under one name. I am not sure that I have done any satisfactory work in clearing up the synonymy. Through the courtesy of M. Frey-Gessner, I have had the opportunity of examining the *Nemouræ* of the Geneva Museum, which contains what remains of the "types" of the two Pictets. It appears, however, that the collection now contains very few examples which can properly be called "types," as the old collection of the elder Pictet was greatly destroyed by *Anthrenus*. Mons. A. Edouard Pictet continued the collection, and added to it, and the whole, after his death, came into possession of the Geneva Museum. A few years ago, Mr. Albarda determined the *Perlidæ;* and the *Nemouræ*, as I understand, now represent little more than the views of that author. As is usual in collections of these insects, females predominate,

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and it is not easy to speak of right and wrong with regard to them; but as there is certainly error in connection with the placing of some of the males, I have been driven, in a great degree, to adopt my own views about Pictet's species. There may be differences of opinion regarding my conclusions, but I trust the notes and figures given will make easy the identification of the species to which I have applied Pictet's names, and will also, in some degree at least, prevent a recurrence of the confusion alluded to at the beginning of this paragraph.

Stephens' types are much more satisfactory than those of Pictet. They are, for the most part, in good condition and serviceable; the drawback in connection with them is the one common to collections of *Nemouræ* already alluded to, namely, the undue proportion of females. My conclusions regarding these types will be referred to in the synonymic references preceding, or the notes following, the descriptions of the species. I have to express my indebtedness to Mr. Chas. O. Waterhouse, of the British Museum, for enabling me to examine Stephens' *Perlidæ*.

Before giving the descriptive and other notes on the species, it may be well to say a few words regarding the characters of *Nemoura*. The genus was established by Latreille in 1796. Pictet adopted the term to cover his three sub-genera, *Tæniopteryx*, *Leuctra*, and *Nemoura*. These three divisions are now generally regarded as separate genera, and the species to be dealt with here are those falling under *Nemoura* proper.

The following are Pictet's diagnoses of the three genera (very slightly modified):—

Tæniopteryx.

(Nervures of pterostigma not forming a χ.)

Labial palpi moderate and separated. Abdomen terminated by short setæ. Three tarsal joints long and nearly equal. Wings in rest half cylindrical.

Leuctra.

(Nervures of pterostigma not forming a χ.)

No caudal setæ. Labial palpi very short. Tarsi with 2nd joint short, 1st and 3rd long. Wings in rest half cylindrical.

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Nemoura.

(Nervures of pterostigma forming a χ.)

No caudal setæ. Labial palpi short and approximate. Tarsi with 2nd joint short, 1st and 3rd long. Wings in rest ordinarily flat.

Albarda has shown that the above-mentioned character in the neuration of *Tæniopteryx* is not absolutely characteristic, as his *T. neglecta** has the wings in the normal condition of a *Nemoura*. The condition of the tarsi will at once prevent any confusion between these two genera, and the wing-neuration character seems to hold good as a means of separating *Nemoura* and *Leuctra*, which agree with each other as regards the tarsi.

With regard to the position of the wings in rest, there appear to be in *Nemoura* slight deviations in the direction of the position they occupy in *Leuctra*; this has been noticed in *N. Meyeri* when alive. Other characters made use of in the above diagnoses will also require further investigation; for example, the presence or absence of caudal setæ. Setæ probably exist in at least one of the species here described as a *Nemoura*. Then the appendages of various species here retained under *Nemoura* show so much diversity of structure that it is almost certain that, sooner or later, further generic subdivision will take place based on these parts.

The figures are from drawings made under the microscope with the *camera lucida*. In most cases, two views are given—one from the side, the other from beneath—the object being held slightly in front of the observer. These figures and the descriptions were all made from dry examples for the sake of uniformity. These insects are subject to great variations in size and colour, according to locality, and they have almost all a tendency to become blackish or unicolorous when dry, and colour characters are, therefore, not of great importance, except in a broad way.

Another feature in these insects (and in all *Perlidæ*) is the instability of neuration, and few details under this head are sufficiently constant to be of help in the separation of species. It has been the practice to lay

* "Annales de la Soc. Ent. de Belgique," Tome xxxiii.

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stress on the form of the pronotum, and this appears to be justified to some extent; but care must also be taken here, as shrinkage in drying is unequal, varying with the degrees of maturity of the individuals. Amongst living examples of the same species of one of the larger *Perlidæ*, I believe that I have noticed a difference between the form of the pronotal plate in examples just disclosed and those in which the chitin had set hard. While the rugose condition of the surface of this segment and the arrangement of the tubercles may be useful for specific determination, I have not yet been able to come to satisfactory conclusions on the point.

In the following descriptions, when reference is made to the wings, the anterior pair is alluded to, unless otherwise stated.

Nemoura variegata.

N. variegata, Olivier, Encyc. Méth., viii., p. 186, No. 3 (1811)?

N. variegata, Pictet, Perlides, p. 386, pl. l. (1841).

N. nebulosa, fuliginosa, pallida, cruciata, affinis, annulata, luteicornis, pusilla, Stephens, Illustrations, p. 140 and 141 (1836).

N. lunata, Rambur, Névroptères, p. 461 (1842).

N. umbrosa, Ed. Pictet, Névropt. d'Espagne, p. 20 (1865), in part according to types.

Head and pronotum yellowish-brown, the latter with darker clouds. Antennæ usually brownish, with paler basal joint. Pronotum very slightly broader than the head without the eyes, with a broad, well-defined border, whose margins are gently rounded both in front and laterally; this segment is minutely granulose with two vague transverse depressions (or three, counting the one behind the anterior border). Meso- and meta-nota dark brown or nearly black, the scutella of these segments and the parts adjoining sometimes paler. Abdomen brown or blackish. Legs varying from brown to yellowish, femora rather darker about the apex, tibiæ with a dark apical annulation, and tarsi, especially the distal joints, fuscous. Wings ranging from nearly hyaline to brownish-grey, with blackish or fuscous neuration, often with fuscous markings in the region of the pterostigma and χ nervures, the pigment in strongly-marked examples spreading out on either side of the nervure forming the base of the 3rd apical cellule into a fuscous triangle. In this species the end of the radius is almost invariably

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considerably turned up just where it joins the outer margin ; the 4th apical cellule is biangulate at the base ; and in the hindwings there are several transverse nervures in the intercubital areas, a state of things not normal in other species. In the ♂ the median prolongation of the ventral plate and the lobe on this plate are both moderate ; the lateral appendages are slender, slightly curved, and narrowing towards the apex, which terminates in two hooks, the lower of which is most evident ; seen from above or beneath, these appendages are straight, the apex slightly out-turned with the tip of the hook turned inwards. In the ♀ the apex of the abdomen has two large ovate lobes and a pair of longer simple appendages. Exp., ♂, 12½ to 20 mm. ; ♀, 15 to 24 mm.

This species is common in Britain, and probably over the whole Palæarctic region. I have seen it from Arctic Norway, Finland, the Vosges, Schwarzwald, Switzerland, Bohemia, Portugal, and Sarepta ; it is also mentioned by McLachlan in "Fedchenko's Travels," as seen by him from Turkestan. To what altitude it goes is uncertain ; very small examples are in McLachlan's collection from the Col du Lauteret, Alps of Dauphiné. It seems attached to standing waters, and even occurs in places where there is little or no surface-water in the dry season. The time of appearance varies with locality from April to August, and probably later.

At once one of the largest (but varying greatly in this respect, some minute examples occasionally appearing) and best-defined species of the whole genus. The granulose prothorax, the condition of the neuration, and the appendages of the ♂ are all characters which can be relied upon. For this reason it is the one *Nemoura* regarding whose name there is something like unanimity of opinion at the present time. Rambur's description of *lunata* is good ; he refers to the appendages of the ♂. The eight species of Stephens' above narrated are certainly all to be referred here according to the types in British Museum ; *pusilla* is a small ♂.

Nemoura avicularis, n. sp.

Head and pronotum shining black, the latter sometimes very narrowly outlined in yellow or orange. Meso- and meta-nota also shining black with a brown posterior marking. Pronotum very slightly broader than the head without the eyes, foremargin and sides hardly rounded, borders not distinct in the dry insect, disc

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faintly rugose. Abdomen blackish. Legs: femora above, ends of tibiæ, and the tarsi all fuscous. Wings greyish in some lights, but almost hyaline, highly iridescent, only very faintly clouded in the pterostigmatic region and about the χ nervures; neuration generally blackish and distinct; the 4th apical cellule rarely biangulate at the base; in the posterior wings the superior cubitus usually leaves the radius at a considerable distance from the basal cell. In the ♂ the median prolongation of the ventral plate is comparatively short; the lateral appendages are broad at the base, contracted in the middle, with a large head, upturned, and acute at the apex externally, and possessing an eye-like tubercle; the distal part of the appendage being very suggestive of a bird's head. Exp., ♂, 17½–18 mm.; ♀, 22 mm.

A species easily recognized by the appendages of the ♂, the very black coloration of the body and the highly iridescent nearly hyaline wings, which have hardly any darker cloudings. With regard to the lateral appendages, while there appears to be a slight amount of variation due to changes in drying, they ordinarily retain their character. The chance of confusion most exists with regard to the next species, but the notes and figures will, I hope, prevent error so far as the ♂ is concerned.

According to our present British information, this species seems to be exclusively lacustrine in habit, and has been found in April and May at many of the lochs in the highlands of Scotland (King and Morton). It is also in Mr. McLachlan's collection from the English Lake District. Outside Britain it has been seen from Finland; the collection of the Helsingfors Museum contains examples from several localities.

This species has apparently already been recognized in this country, but associated hitherto with one of Pictet's names, a view I cannot in the meantime accept. The insect is as yet only known as an inhabitant of Northern Europe.

Nemoura cambrica.

N. cambrica, Stephens, Illustrations, p. 143 (?).
N. pallicornis and *nitida*, ibid., p. 143 (?).

Head and thoracic segments shining blackish. Antennæ brownish or black. Pronotum nearly as broad as head, with pale lateral margins which recede slightly posteriorly. Legs usually yellowish, darker on the femora above and on the tarsi. Wings

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brownish-grey, with darker pterostigma and fuscous or blackish neuration. The lateral appendages of the ♂, viewed from the side, are rather broad and rounded at the base, the shaft slender and subcylindrical, bent beyond the middle and continued outwards into a subacute point; viewed from beneath, the apical part of the appendage is turned outwards in the form of a thick hook; inwardly, the chitinized part is prolonged into a spur, under which is a membranous space. Exp., 12 to 18 mm., the ♀ the larger.

The smaller size and less hyaline wings will ordinarily suffice to distinguish this species from the last; the form of the appendages is constant in all the material I have examined, and I have never noticed any tendency in them to assume the upturned position they occupy in the last; in the present species they are also much more slender.

This is one of the commonest *Nemouræ* of all the streams of North Britain wherever I have collected. It has occurred by all sizes of running waters, from the larger rivers to the tiniest rills, the size of the insect varying according to the extent of the waters it inhabits. It has not yet come before me from the Continent.

The application of the name *cambrica* is open to question. The only type seen by me is a ♀, and, therefore doubtful. *N. pallicornis* and *N. nitida* are both represented by females without abdomen; they are more probably large examples of the species which I have named *N. inconspicua*.

Nemoura lateralis.

N. lateralis, Pictet, Mém. de la Soc. de Phys. et d'Hist. Nat., vii., p. 180 (1836); and Perlides, p. 395 (1841); ♂ (?).

N. nitida, Pictet, Mém. Soc. Phys., p. 179; and Perlides, p. 392; ♀ (?).

Head and thoracic segments brownish, or black mixed with brown, margins of pronotum paler. Antennæ concolorous with head, basal joint often paler. Pronotum about same breadth as head without the eyes, with margins moderately distinct, receding very little posteriorly. Legs yellowish, femora above marked with fuscous, as are also the tips of the tibiæ, and the tarsi. Wings in the ♂ usually nearly hyaline, in the ♀ rather more greyish, neuration fuscous, membrane faintly clouded about the χ nervures and pterostigma. The appendages of the ♂, from whatever aspect

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viewed, do not show the distinct hook-like form of the two preceding species; seen from above, their chitinous part is somewhat bifid, the furcation filled out with membrane; viewed from the side, their base is broad and rounded, from which they taper in a nearly straight direction to the apex, where they again have a broader aspect, the upper and more chitinous part of the apex being slightly turned outwards, and the lower membranous part produced downwards; from beneath, the appendages are straighter than in the two foregoing species, the apex being scarcely curved, but turned out at nearly right angles, and terminating in a sub-acute point. Exp., ♂, 13–17 mm; ♀, 18½–22½ mm.

Apparently a very common Swiss insect; received in great quantity from Dr. Ris, taken on the Zürichberg in April and May, and varying much in size and colour. What I consider the same insect is present in great numbers and variety in Mr. McLachlan's collection from various Swiss localities, including the Engadine, Haslithal, etc. (McL.); also from Savoy, Chamounix (McL.), Schwarzwald, the Vosges (McL.), and Carinthia (Zeller). I have also received it from Bohemia (Klapálek).

An insect easy to distinguish in the ♂ sex; the ♀ might easily be confused with some of its allies, especially *N. avicularis*. The prothorax in the latter is, perhaps, relatively broader, the borders less definite, and the margins more rounded; but in the dry insects these characters could hardly be relied on with confidence. Some of the large ♀s from the Alps of Switzerland and Savoy look very different from the normal ♀; they have an almost square pronotum, are greyer than usual, and have the veins more clouded. These deserve attention.

This species seems to agree pretty well with Pictet's description of *N. lateralis*. I accept the opinion now generally adopted, that Pictet's *N. nitida* is the ♀ of the same species.

Nemoura dubitans, n. sp.

Dark brown or black, shining, antennæ dark brown. Pronotum broad, with distinct, usually pale, somewhat rounded margins. Legs brownish, femora darker above, as are also the apices of the tibiæ and the two distal joints of the tarsi. Wings transparent, of uniformly brown tint with darker pterostigma; neuration not very strong. The ♂ is easily distinguished from all others nearly allied by the genital parts. The ventral plate has the lobe thereon

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long and narrow; the lateral appendages of about the ordinary length, tapering slightly to the apex, which is obtuse and apparently simple. Exp., ♂, 15 mm.; ♀, 20 mm.

The brownish aspect of this fly is a good *prima facie* character for its determination; the weak neuration and the form of the lateral appendages are also of importance. All the examples are from Dr. Ris, and are labelled "Oerlikon, April." A species requiring further elucidation, but I think it is a good one. Confusion especially in the ♀ sex is likely to take place with the species I here name *N. marginata*, but the characters of the ♂ appear to be decisive.

Nemoura præcox, n. sp.

Phryganea regelationis, Scop., Ent. Carniolica, p. 269 (?).

Head and thorax black, antennæ concolorous; pronotum broader than the head without the eyes, short, borders not well defined in the dry insect, lateral margins usually with a slight angulation about their middle part, behind which they recede somewhat. Legs: femora above, ends of tibiæ and the tarsi blackish fuscous. Wings greyish, sometimes fuliginous, neuration blackish fuscous; all the veins margined more or less with darker cloudings, which are most distinct about the pterostigma and χ veins. The anal structure of the ♂ is complicated: the lobe of the ventral plate is of great size. What appears to correspond with the long spinous sheath of *N. Meyeri* consists here of a broad basal part with a very short spine. Exp., ♂, 18 mm.; ♀, 20–23 mm.

The complicated anal structure of the ♂ and the somewhat fuliginous aspect of the wings should make this insect recognisable. The form of the prothorax above alluded to is constant in the British examples which I have examined.

Apparently not rare in Great Britain. It occurs in early March (if not earlier in mild seasons) by the River Clyde and one of its affluents, along with *Tæniopteryx nebulosa* and *T. trifasciata*. I have also seen both sexes from Perthshire rivers in April (King), and two ♀s are in Mr. McLachlan's collection from the Manchester district in March (Cooke).

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That this is really Scopoli's insect is very doubtful. Still the name is singularly appropriate, and I would have adopted it in preference to creating a new one, if such a course had been at all prudent.

Nemoura maracandica.

Tæniopteryx maracandica, McLachlan, Fedchenko's Travels in Turkestan, Neuroptera, p. 54.

Black, with greyish pubescence, somewhat shining. Head concave in middle of disc. Pronotum almost quadrate, sides straight, nearly parallel, anterior angles sub-acute, disc faintly rugose. Feet sub-testaceous, with greyish pubescence, femora fuscous externally, tibiæ fuscous at base, tarsi black. Abdomen black; ventral lamina of ♂ triangular, truncate, beneath somewhat concave; appendages testaceous. Ventral lamina of ♀ large, adpressed, sub-testaceous, with rounded margin. Anterior wings elongate, greyish, faintly irrorated with darker grey dots, neuration blackish fuscous. Exp., al., 18–24 mm.

Found near Samarcand and Taschkent. I have seen the types, but the above description is mainly from Mr. McLachlan's diagnosis. The insect is a large one, with the facies of a *Tæniopteryx*, and is very distinct on account of its dotted wings.

Nemoura ornata.

N. ornata, McLachlan, Fedchenko's Travels in Turkestan, Neuroptera, p. 55.

Blackish with greyish pubescence, shining; head concave in middle of disc. Pronotum transversely sub-quadrate, sides straight, parallel, disc almost smooth. Feet black, with greyish pubescence, femora with apex testaceous. Ventral lamina of ♀ large, adpressed, entire, transversely striate. Anterior wings short, broad, vitreous, with blackish neuration; two irregular transverse fasciæ, margins of the nervures and some small clouds all smoky. Inferior branch of sector much curved. Exp., al., 17–17·5 mm. (♀).

This species is from the mountains of Khokan. I am indebted to Mr. McLachlan for a sight of the types, and the above is mainly a translation of his diagnosis. A pretty little species marked somewhat after the manner of *N. Meyeri*, but the markings are much more definite; the femora are also nearly altogether dark externally.

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Nemoura Meyeri.

N. Meyeri, Pictet, Perlides, p. 390, pl. li.

Head and thoracic segments black, antennæ blackish, hind-head and margins of pronotum usually yellowish, the latter segment about same breadth as head with very slightly rounded margins (the material examined shows great variation in the form of the pronotum). Legs yellowish, *middle* and apex of femora, apex of tibiæ and tarsi blackish. Wings greyish, often whitish, most of the nervures broadly bordered with brownish grey, or the colour might be given as brownish grey with white spots; pterostigma pale in the middle and dark on either side; neuration blackish, extreme end of radius upturned, lower branches of sector and superior cubitus usually much curved. The most characteristic feature of the ♂ genitalia is a pair of long upturned spine-like sheaths. The large upturned pieces behind these sheaths appear to be flanked by blackish pectinated pieces which are often concealed. Exp. ♂, 15½–18½ mm.; ♀, 18½–24 mm.

In what may be termed typically marked examples, this species may be easily recognised by the two-coloured pterostigma, the curved neuration above alluded to, and the marking on the *middle* of the femora is also of importance. With regard to the genitalia of the ♂, confusion is possible with *N. marginata*; in the latter species, however, the "upturned spine-like sheaths" are not usually so straight and they end in two points, and the pectinated pieces are much more conspicuous and have much longer teeth than in *Meyeri*. Well-marked examples of the species are usually correctly named.

I can say little regarding the geographical distribution of this species. It is rather common at many streams in North Britain in May and June, and even later in localities of some altitude. It is also represented by large examples from Carinthia in the collection of Mr. McLachlan and from Switzerland in that of Dr. Ris.

Under the name of *N. nitida*, Pictet, Professor Klapálek has communicated a pair of Bohemian insects, the ♂ immature and the ♀ closely resembling *N. Meyeri*. The paired spines are not unlike those of the species hereafter described as *N. marginata*; they appear to be shorter and broader before the apex than in *N. Meyeri*, and terminate in two more or less divergent spines. This

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may be a good species but more material is required. On account of the immaturity of the ♂ the figures are not satisfactory.

Nemoura marginata.

N. marginata, Pictet, Mém. Soc. Phys., tom. vii., p. 181, No. 7; and Perlides, p. 397 (?).

N. humeralis, Pictet, Mém. Soc. Phys., tom. vii., p. 184, No. 11; and Perlides, p. 399 (?).

Head and pronotum shining blackish, mixed with brown especially on the hind-head. Pronotum slightly narrower than head; borders not well defined, usually paler, the lateral margins recede very slightly posteriorly. Legs pale brown. Wings usually brownish, sometimes suffused, in other examples nearly hyaline, neuration darker especially in the region of the pterostigma and χ nervures. The structure of the genitalia is complicated; the paired sheaths are in this species much as in *N. Meyeri*, but instead of ending in a simple acute point the apex is crowned by two short spines, and there appears to be another spine at some distance from the apex. The strong upright pieces are flanked by a chitinous sheath which is deeply pectinate, although the pectinations may sometimes be so closely appressed that they are difficult to see. Exp., 18–22 mm.

In applying to this species the name of *marginata*, Pictet, I have been guided chiefly by the fig. of that author which agrees tolerably well with a common brownish Swiss insect. The limits of the species are, however, difficult to define, and there is a certain confusion regarding it and *N. humeralis*, a species not yet elucidated to my satisfaction. Professor Klapálek sent me a ♀ agreeing very well with Pictet's description of *N. humeralis*, and also forwarded drawings of what he considered the ♂, but in the great number of examples examined by me I have not yet seen a ♂ which agreed with Klapálek's ♀, and I am inclined to consider the latter as a condition of the species under review. In the rich materials forwarded by Dr. Ris, I found three forms which I have in the meantime referred here; the first series is from Glarus, in October, headed by a ♂, from which figs. 1 and 2 are taken; the females of this series have the wings comparatively transparent with rather strong neuration. The second series mainly from the Zürichberg in June have the wings more suffused and

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therefore more typical; unfortunately, it contains no males. The third contains larger ♀ examples also from Zürichberg in May; the wings in these are brownish and transparent; these are most doubtful.

With regard to distribution, in addition to Switzerland and Bohemia, insects which are temporarily referred to this species are in Mr. McLachlan's collection from Carinthia and the Schwarzwald.

Nemoura lacustris.

N. lacustris, Ed. Pictet, Névropt. d'Espagne, p. 21 (?).

Head and pronotum blackish or piceous, antennæ concolorous, occiput and margins of pronotum sometimes paler. Pronotum nearly as broad as head without the eyes, sub-quadrate, lateral margins scarcely receding. Legs dingy testaceous, darker at apices of joints. Wings greyish, sometimes with a faintly brownish tint, subhyaline, iridescent, χ nervures faintly clouded, clouding of pterostigma often leaving a clear costal space almost as in *Meyeri*; radius slightly upturned at apex. In the ♂ the genitalia are very similar to those of *marginata*, but in none of the examples examined are the pectinations of the sheaths flanking the upright pieces visible, and the upturned spines are apparently shorter and stouter. Exp. al., 19 mm.

Closely allied to *N. marginata*, but apparently distinct on account of the much shorter and stouter upturned spines of the ♂. The examples from which the descriptive notes are taken are in Mr. McLachlan's collection; they came from Portugal and the Pyrenees.

There is doubt about the application of Ed. Pictet's name. I have seen the types, and they bear resemblance to the insects from which the above description is drawn, but they now lack abdomens.

The group which contains the three species described as *Meyeri*, *marginata*, and *lacustris* is the least satisfactory of all here dealt with; the appendages are complicated in the dry insects, and difficult to understand; confusion between degrees of exsertion and real differences of structure seems to be a danger to be specially guarded against.

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Nemoura cinerea.

N. cinerea, Olivier, Enc. Méth., viii., p. 186, No. 2 (?).
N. cinerea, Pictet, Perlides, p. 401 (?).
N. sulcicollis and *N. fumosa,* Stephens, Illustrations, p. 143.

Shining, black with concolorous antennæ. Pronotum usually distinctly transverse, about as broad as head, lateral margins straight without definite borders. Legs brownish. Wings grey, nearly hyaline, but sometimes smoky, with fuscous neuration, which is nearly black and usually very strong about the x nervures and pterostigma. In the ♂ the median prolongation of the ventral plate is of unusual length, and the ventral lobe is long and narrow ; there is present a pair of very strong upturned usually blackish sheaths which appear to be obtuse at the apex. Exp., 11–15½ mm.

This species I have found very common in June and July at all the Scotch streams where I have collected. I have received from Klapálek both sexes, these Bohemian examples having the neuration less distiuct than in most British specimens. Only one rather doubtful ♀ example was in Dr. Ris' collection, but the species probably occurs commonly in some parts of Switzerland. Examples in Mr. McLachlan's collection from several countries are referred by me to this species: France (Autun and the Vosges), Switzerland (Engadine), and Schwarzwald; probably, also, Portugal (Eaton), and Carinthia (Zeller).

Professor Klapálek considers this species to be Pictet's *N. cinerea,* and I am inclined to agree with him, although the view has been considered by some as doubtful. Whether it is Olivier's *cinerea* is a point which may be questioned with more reason. The species is very variable, and I think Stephens' two species above-mentioned are certainly forms of it.

Nemoura borealis, n. sp.

Head dark shining brown, antennæ usually paler. Pronotum brownish, sub-quadrate, narrower than the head. Legs testaceous, almost without darker markings. Wings pale, subhyaline, with very pale neuration. In the ♂ the ventral lobe or lamina is rather narrow and elongate ; appendages rather broad at the base, tapering, twisted in the dry insect, expanding towards the somewhat flat-

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tened apex, the margins of which are deeply serrate. Exp., about 15 mm. in ♂ ; the ♀ larger.

So far as the material examined shows, this is a small, pale, rather delicate-looking insect, but it is absolutely devoid of any striking outward character. The appendages, however, are very unlike those of any other species.

I have seen it from several Finnish localities, and I believe Mr. McLachlan has it from Lapland.

Nemoura inconspicua.

N. inconspicua, Pictet, Mém. Soc. Phys., tom. vii., p. 185, No. 12 (?).
N. inconspicua, Pictet, Perlides, p. 404, pl. liii. (?).
N. pallipes, Steph., Illustr., p. 142 (?).
N. pallicornis, Steph., Illustr., p. 143 (?).
N. nitida, Steph., Illustr., p. 143 (?).

Shining blackish or brown, prothorax as broad as head with pale broad borders and receding lateral margins. Legs yellowish, femora hardly marked, tibiæ with dark tips, and apical joints of tarsi also darker. Wings pale, nearly hyaline, with faint light brown neuration. In the ♂ the genitalia are very prominent, and consist principally of two large subcylindrical upper yellowish lobes, and a pair of very long slender upturned yellow sheaths. Lobe of ventral plate long. Exp., ♂ 13–15½ mm., ♀ 17–18 mm.

One of the most easily determined of the *Perlidæ*. Its generally pale colours and the prominent genitalia in the ♂ separate it from all its congeners. In Scotland I have taken it sparingly in July and August; it is attached to smaller streams and to springs. It is well represented in the Swiss collection of Dr. Ris. Mr. McLachlan has taken it at Chamounix in July.

This species agrees with Pictet's description as far as that goes. I think, however, it is more than likely that Pictet's species was really a combination of minute forms belonging to more than one species. Stephens' species, above alluded to, are probably large females of this insect.

The insects noticed in the preceding pages almost certainly represent but a small proportion of the species which exist in the Palæarctic region. In addition to many females which must remain doubtful, including two in Mr. McLachlan's collection from Algeria (Eaton),

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interesting as being the only *Nemouræ* seen by me from the African side of the Mediterranean, there is at least one other good species from Turkestan in the same collection, but hardly in sufficient material to warrant description.

In commending these insects to the notice of collectors, I would urge upon them not to despise insignificant-looking examples, as these are usually the males, and most useful for purposes of determination. If possible, all *Perlidæ* should be expanded at once, as few insects are so ill-suited for the relaxing box.

Explanation of Plates XIII and XIV.

PLATE XIII.

Nemoura variegata.

1. Apex of abdomen of ♂ from beneath.
2. Lateral appendage from side, much enlarged.

Nemoura avicularis.

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

Nemoura cambrica.

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

Nemoura lateralis.

1. Apex of abdomen of ♂ from beneath.
2. Lateral appendage from side, more enlarged.
3. „ „ above „

Nemoura dubitans.

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

Nemoura præcox.

1. Apex of abdomen of ♂ from beneath.
2. Pronotal plate.

Nemoura maracandica.

Apex of abdomen of ♂ from beneath.

Nemoura meyeri.

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

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Nemoura marginata.

1. Apex of abdomen of ♂ from side.
2. „ „ beneath.
3. „ pectinated piece, more enlarged.

Nemoura cinerea.

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

Nemoura inconspicua.

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

Nemoura ——— ? sp. from Bohemia (see page 568).

1. Apex of abdomen of ♂ from beneath.
2. „ „ side.

PLATE XIV.

Nemoura variegata.

1. Anterior wing.
   - A. Costa.
   - B. Sub-costa.
   - C. Radius.
   - D. Sector radii.
   - E. Superior cubitus (otherwise median nervure).
   - F. Inferior cubitus, upper branch (otherwise superior cubitus).
   - G. Inferior cubitus, lower branch (otherwise inferior cubitus).
   - H. Upper branch } of fork of superior cubitus or
   - I. Lower branch } median nervure.
   - J. Upper branch } of fork of sector radii.
   - K. Lower branch }
   - 1, 2, 3, 4, 5, 6. Apical cellules.
2. Posterior wing.
3. Tarsus.

All much enlarged.

Nemoura borealis.

Apex of abdomen of ♂ from beneath.

Nemoura lacustris.

1. Apex of abdomen of ♂ from beneath.
2. "Sheath" from side.
3. „ from beneath, more enlarged.

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XXIV. *Supplementary Notes on the* Scolytidæ *of Japan*, with a list of species. By Walter F. H. Blandford, M.A., F.Z.S.

[Read October 3rd, 1894.]

The purport of these notes is to complete my previous papers on the *Scolyto-platypini* and on the *Scolytidæ* of Japan by the rectification of one or two errors which have crept in, by the addition of three new species which have since come to hand, and by the publication, for convenient reference, of a list of Japanese *Scolytidæ*.

In my paper on the *Scolyto-platypini* (Trans. Ent. Soc. 1893, p. 425) on p. 430, fourth line above the foot-note, *for* "anterior" *read* "posterior femora"; on p. 431, thirteenth line, a semicolon should follow the word "remote."

In my paper on the *Scolytidæ* of Japan (Trans. Ent. Soc. 1894, p. 53) on p. 103, last line, *for* "separate" *read* "asperate."

The following species should come after *Xyleborus brevis*, on p. 104:—

Xyleborus amputatus, sp. n.

Fem. Cylindrica, subnitida, breviter pilosa, testacea; prothorace semi-elliptico, margine antico convexo subcrenato, dorso medio transverse elevato, postice sat dense subtiliter punctato et in basi media hirto; elytris prothorace longioribus, parallelis, subtiliter lineato-punctatis, interstitiis confuse punctatis, apice oblique truncato, truncatura subcirculari, per totum acute marginata, opaca, lineato-punctata, utrinque subconcava. Long. 2·5 mm.

Hab. Japan, Higo; one specimen (*coll. Lewis*).

Fem. Cylindric, moderately shining, testaceous, with short pubescence. Head concealed in the type, antennæ light testaceous, of normal structure. Prothorax semi-elliptic, widest near the middle, the sides rounded from the base, slightly behind, more strongly towards the convex apex, the margin of which is finely

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[illegible]

[illegible] species is most like [illegible] with which I identify a Tasmanian [illegible] before me. This species is larger, darker and without the patch of hair on the base of the prothorax; its elytra are longer, the apical truncate surface is nearly vertical, convex, shortly pilose, shining, with three impressed striæ on either side, the interstices convex and multipunctate.

The following species should succeed *X. validus* on p. 108:—

Xyleborus interjectus, sp. n.

Fem. Oblonga, sat nitida, nigro-picea; *X. valido*, Eichh. simillima, distinguenda elytris pro portione brevioribus, prothorace vix sesqui longioribus, a basi usque ad apicem convexioribus, lineato-punctatis, striis non impressis, interstitiis planis, pilis erectis longioribus e punctis subasperatis egredientibus per totum confertius seriatis, apice minus deplanato, punctis striarum et tuberculis minoribus, interstitiis vix convexis. Long. 3·4 mm.

Hab. Japan; one specimen (*coll. Lewis*): China, Chusan Is. (*Walker*).

This species so closely resembl[illegible] mon Japanese *X. validus* that it is not ne[illegible] give further characters than those contained [illegible] osis. It ca[illegible] be distinguished without com[illegible] e non-im[illegible] pressed lines of punctures on th[illegible] long and close seriate bristles of the inte[illegible]

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up to the base from punctures which have at least the anterior margin elevated, so as to be subtuberculate. I have seen over a hundred examples of *X. validus* without finding any intermediate forms between the two species.

The next species should follow *Trypodendron quercus*, on p. 124:—

Trypodendron sordidum, sp. n.

Fem. Cylindrica, subelongata, parum nitida, sordide dilute testacea, capite, prothoracis antica dimidia parte medio, elytrorum lateribus et apice infuscatis, sat dense pilis subtilibus erectis adspersa; antennarum clava breviter ovali, obtusa; prothorace longitudine breviori, anterius fortiter rotundato, apice bituberculato, supra mox post medium obscure transverse elevato, basi reticulata, punctata; elytris dense confuse punctatis, punctis hinc illinc in lineas ordinatis, apice convexo, substriato, ruguloso, densius piloso. Long. 3·8 mm.

Hab. Japan; one specimen (*coll. Lewis*).

Fem. Somewhat elongate, cylindrical, obscurely shining, dirty yellow testaceous, the head, the middle part of the anterior half of the thorax, the sides and apex of the elytra infuscate, the latter less deeply. Head rugosely punctured in front with a median smooth line, with thin erect pubescence, denser over the mouth; antennal club short oval, obtuse in front, with rather thin pubescence, chiefly at the sides and apex. Prothorax broader than long, widest at the base, the sides strongly rounded from behind the middle to the apex, its anterior margin nearly circular, with two prominent median tubercles; surface with an obscure transverse elevation just behind the middle, asperate anteriorly, the asperities forming fine transverse lines, posteriorly finely reticulate and rather dull, with fine punctures, subasperate in the middle line to the base, pubescence fine erect and short, thinner over the median area. Scutellum small, rounded, infuscate. Elytra two-thirds longer than the prothorax, and narrower than its base, their basal margins separately convex, the shoulders rounded, the sides parallel, the apex subcircularly rounded; surface cylindric, strongly declivous behind, with rather dense fine semi-erect pubescence, and close irregular punctuation very indistinctly lineate near [illegible] apical declivity subconvex, more densely pilose, with [illegible]gulose punctuation and traces of impressed striæ. [illegible] legs pale testaceous.

[illegible]es is very like *T. pubipenne*, Blandf., but is [illegible] and cylindrical. The club of the antenna

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is in form a short, almost orbicular, oval, whereas in *T. pubipenne* it is by comparison slightly but perceptibly acuminate.

In my description of the latter insect the club is incorrectly described as non-acuminate. It appears so when compared with that of *T. quercus*, but not with that of the present species. The rows of punctures on the elytra of *T. pubipenne*, indistinct though they are, are much more evident than in *T. sordidum*, and the sutural row is perceptibly, though weakly, impressed; on the other hand, the apex of the elytra in the former species shows no trace of striæ.

T. sordidum is even more like the description of *T. politum*, Say, than is *T. pubipenne*, but as it appears to be a larger insect, and, as far as I can discover, is without any suture on the antennal club, I hesitate to identify it with that American species.

Crossotarsus concinnus, n. n.

C. chapuisi, Blandf., Trans. Ent. Soc. 1894, p. 129.

I unfortunately overlooked the fact that Duvivier had described an African *Crossotarsus* under the name *chapuisi*, and therefore substitute the above name for the one I previously employed.

SCOLYTIDÆ NIPONICÆ.

SCOLYTINI.

HYLASTES, Er.
- parallelus, *Chap.*
- attenuatus, *Er.*
- plumbeus, *Blandf.*
  - *obscurus, Chap.*
- ambiguus, *Blandf.*
- interstitialis, *Chap.*
- glabratus, *Zett.*
  - *decumanus, Er.*

MYELOPHILUS, Eichh.
- piniperda, *Fabr.*
- minor, *Hart.*

HYORRHYNCHUS, Blandf.
- lewisi, *Blandf.*

SPHAEROTRYPES, Blandf.
- pila, *Blandf.*

HYLESINUS, Fabr.
- costatus, *Blandf.*
- nobilis, *Blandf.*
- laticollis, *Blandf.*
- tristis, *Blandf.*
- cingulatus, *Blandf.*
- scutulatus, *Blandf.*

PHLOEOSINUS, Chap.
- pulchellus, *Blandf.*
- dubius, *Blandf.*
- minutus, *Blandf.*
- perlatus, *Chap.*
- seriatus, *Blandf.*
- lewisi, *Chap.*
- rudis, *Blandf.*

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Polygraphus, Er.
oblongus, *Blandf.*
proximus, *Blandf.*
miser, *Blandf.*

Scolytus, Geoff.
esuriens, *Blandf.*
agnatus, *Blandf.*
frontalis, *Blandf.*
aratus, *Blandf.*
japonicus, *Chap.*
claviger, *Blandf.*

TOMICINI.

Crypturgus, Er.
pusillus, *Gyll.*

Cryphalus, Er.
exiguus, *Blandf.*

Hypothenemus, Westw.
tristis, *Eichh.*
peritus, *Blandf.*
expers, *Blandf.*

Cosmoderes, Eichh.
consobrinus, *Blandf.*

Pityophthorus, Eichh.
jucundus, *Blandf.*

Eidophelus, Eichh.
imitans, *Eichh.*
minutus, *Blandf.*

Tomicus, Latr. (1807.)
cembrae, *Heer.*
angulatus, *Eichh.*

Acanthotomicus, Blandf.
spinosus, *Blandf.*

Dryocoetes, Eichh.
autographus, *Ratz.*
pilosus, *Blandf.*
affinis, *Blandf.*
luteus, *Blandf.*
nubilus, *Blandf.*
moestus, *Blandf.*
dinoderoides, *Blandf.*
apatoides, *Eichh.*

Coccotrypes, Eichh.
graniceps, *Eichh.*
perditor, *Blandf.*
advena, *Blandf.*

Xyleborus, Eichh.
mutilatus, *Blandf.*
brevis, *Eichh.*
cucullatus, *Blandf.*
amputatus, *Blandf.*
lewisi, *Blandf.*
rubricollis, *Eichh.*
apicalis, *Blandf.*
atratus, *Eichh.*
germanus, *Blandf.*
compactus, *Eichh.*
semi-opacus, *Eichh.*
orbatus, *Blandf.*
concisus, *Blandf.*
validus, *Eichh.*
galeatus, *Blandf.*
interjectus, *Blandf.*
obliquecauda, *Motsch.*
aquilus, *Blandf.*
praevius, *Blandf.*
seriatus, *Blandf.*
pelliculosus, *Eichh.*
muticus, *Blandf.*
festivus, *Eichh.*
glabratus, *Eichh.*
bicolor, *Blandf.*
attenuatus, *Blandf.*
sobrinus, *Eichh.*
adumbratus, *Blandf.*
badius, *Eichh.*
vicarius, *Eichh.*
minutus, *Blandf.*
schaufussi, *Blandf.*
defensus, *Blandf.*
exesus, *Blandf.*

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Trypodendron, Steph.
quercus, *Eichh.*
var. nipponicum, *Blandf.*
sordidum, *Blandf.*
pubipenne, *Blandf.*

SCOLYTO-PLATYPIDÆ

Scolyto-platypus, Schaufl.
tycon, *Blandf.*
shogun, *Blandf.*
daimio, *Blandf.*
siomio, *Blandf.*
mikado, *Blandf.*

PLATYPIDÆ

Crossotarsus, Chap.
concinnus, *Blandf.*
chapuisi, *Blandf.*
niponicus, *Blandf.*
contaminatus, *Blandf.*

Platypus, Herbst.
modestus, *Blandf.*
lewisi, *Blandf.*
severini, *Blandf.*
calamus, *Blandf.*
hamatus, *Blandf.*

Diapus, Chap.
aculeatus, *Blandf.*

Genyocerus, Motsch.
adustipennis, *Motsch.*

107 spp.

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XXV. *Descriptions of the* Pyralidæ, Crambidæ, and Phycidæ *collected by the late* T. Vernon Wollaston *in Madeira.* By George T. Bethune-Baker, F.L.S.

[Read Oct. 17th, 1894.]

My former notes on Mr. Wollaston's lepidopterous collections in Madeira dealt only with Macro-lepidoptera, the present paper will therefore treat of the Pyralidæ and Phycidæ (Lord Walsingham having most kindly catalogued the Pterophoridæ, Tortricidæ, and Tineidæ). I shall, as before, follow the arrangement of Staudinger's catalogue.

Aglossa cuprealis, Hb.

Common, very variable in size, the smallest specimen being barely 16 mm., or less than half the size of two or three of the largest. All are dark, strongly-marked examples.

Asopia farinalis, L.

Not uncommon around Funchal.

Scoparia decorella, Sttn.

Described by Stainton in the Ann. and Mag. Nat. Hist., 3rd ser., 1859, p. 210, thus:—

"Alis anticis albidis, striga anteriore recta latiuscula, striga posteriore tenui arcuata et indentata, externe late saturate fusco marginata, signo ♂ ochraceo expleto spatio ante marginali angusto albo. Exp. al. 8 l. In the sharp contrast of colour, this resembles *E. resinea*; but from that species it is abundantly distinct by the form of the second striga, the distinct white submarginal space and the ochreous filling up of the mercurial marking. Inhabits Madeira proper."

This species, though like *resinea*, is also very close to *lineola*; [illegible] proper position will therefore be between these [illegible]cies.

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Scoparia frequentella, Sttn., and var. *Concinnella,* Curtis.

I have before me both typical specimens and Curtis's variety, in which the whole of the central area is dark.

Scoparia scoriella, Woll. (Zell. in litt.).

Described by Wollaston (Ann. and Mag. Nat. Hist. 1858, 3rd ser., I., p. 119) as follows :—

"Alis anticis subangustis, pulverato fuscis, strigis duobus tenuibus arcuatis externe latius fusco-marginatis, signo ♂ obscurius expleto; spatio ante-marginali latiusculo, superius nigro-lineato, posterioribus fusco-cinereis. ♂ ♀ exp. alar. vix 11 lin. Inhabits Madeira proper, occurring in similar spots to the last-mentioned species [o] (*i.e.*, to the next species following this, viz., *stenota*).

This is a somewhat darker insect than the following, but may be differentiated by the first line being toothed interiorly, not exteriorly, whilst the whole of the space from the second line to the hind margin is entirely dark. The secondaries are brownish grey. Exp. alar. 20 mm. A rarer insect than *stenota.*

Scoparia stenota, Woll. (Zell. in litt.).

Described by Wollaston in the same work and on the same page as the preceding, thus :—

"Alis anticis angustis apice acuto. Strigis duabus albidis postice late nigricanti-marginatis, priore acute fracta posteriore tenui biarcuata punctis duobus nigris cum striga, prioris umbra confluentibus signo ♂ obliquo posterioribus cano-albidis. Exp. alar. vix 11 lin. Inhabits Madeira proper; abounding in grassy spots, chiefly of a rather lofty elevation."

This species is fairly constant in markings. The colour of the wings is grey, the primaries in fresh specimens being almost entirely covered with very dark scales, the two transverse lines are white, the first acutely-toothed posteriorly, the second doubly arcuate, and dentated interiorly, both are broadly margined on the outside with blackish. A small black dot is in the centre of the wing,

[o] Ann. and Mag. Nat. Hist. 1858, 3rd ser., I., p. 119.

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followed below, but nearer to the base, by a short blackish dash, extending into the tooth of the first transverse line. Apex subacute, ♀ with very much narrower wings than ♂. Hind wings silver grey. Exp. alar. ♂ 18–20 mm.; ♀ 15 mm. The ♀ is generally decidedly darker than ♂. This species will follow *angustea*.

Scoparia wollastoni, n. sp.

Primaries white, the two transverse lines irregular, each inclined towards the centre, a very limited portion of base black, followed up to the first line by greyish greenish yellow; central area black, sprinkled plenteously with scales of the aforesaid greenish ochreous colour, with which the upper part of the fairly distinct mercurial mark is also filled. Beyond the posterior line and right up to margin, the wing is entirely of this same colour, which in this larger area assumes a lustrous appearance. At the apex near the costa, and also at the anal angle, there is a plentiful sprinkling of super-imposed dusky scales; near the apex and also at the anal angle are two crescentic white marks close to the posterior margin Fringes grey, paler at extremities. The wings are rather broad and somewhat rounded at the apex. Secondaries translucent grey.

One specimen from Madeira; abdomen broken, but probably from the antennæ a ♂. Mr. Meyrick says of this species, "Quite new to me, and a fine species."

Hellula undalis, F.

Fairly common; one specimen labelled Funchal, others without definite locality.

Botys sanguinalis, L., var. *Hæmatalis*.

One beautifully deep pink and yellow example; parent form not rare.

Botys poligonalis, Hb.

Abundant at low and intermediate elevations.

Botys asinalis, Hb.

One unusually large example.

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Botys maderensis, n. sp.

♂ Primaries bright umber-brown, the dark basal line just before the orbicular very interrupted; orbicular stigma fairly distinct, finely encircled by a dark line; reniform stigma very distinct, finely encircled with blackish, and filled in with dark grey. The subterminal transverse curved line is composed of a series of dark grey scallops, interrupted at each nervure, and preceded by a dark dot, the scallops and dots being most distinct in the middle; a fine shading of the ground colour follows these markings, from whence, up to the posterior margin, the whole of the space is filled in with very dark grey, getting paler near the margin, which (margin) is dotted with blackish at the termination of each vein. Antennæ sub-pubescent. Fringes dark grey, with paler extremities and a pale dividing line. Secondaries uniform dark greyish umber, darker near posterior margin, which is darkly dotted as in primaries; fringes as primaries. Exp. alar. about 32 mm.

The ♀ differs in no respect from the ♂ beyond being duller in hue; antennæ simple. This species is nearest Walker's *Scopula delineatalis*, from St. Helena. It can, however, at once be recognized by its uniformly dark secondaries, which in *delineatalis* are whitish, very broadly and darkly bordered; the latter is also of a smaller size.

Seven specimens in both sexes.

Botys atlanticum, n. sp.

Primaries uniform pale ochreous grey, with a small dark grey dot about the centre of the upper part of the discoidal cell, and another at the upper extremity, whilst directly beyond the lower extremity is a large conspicuous dark grey spot. The sub-terminal line is represented by a curved row of dark grey small dots, one on each nervure, from the sub costal to the 3rd median; the termination of each of the veins in both wings is darkly dotted. Fringes same colour as wings. Antennæ simple. Secondaries rather darker grey, with a dark grey border, broad at the apex, but disappearing gradually at the anal angle. In the centre of discal cell is an irregular dark grey spot. Fringes whitish. One ♀ specimen. Exp. alar. 33 mm.

I know of no species at all like this insect, but it

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evidently belongs to the same sub-division as the preceding species.

Botys ruficostalis, Ld.

One specimen from Madeira, and I have recently received others from this island.

Botys numeralis, var. *Illutalis*, Guen.

There are five specimens of a *Botys* very nearly allied to *numeralis*. Guenée says his species may be a local variety of it, and it is possible my specimens may be the same; at any rate, I shall temporarily place them under this name.

Nomophila noctuella, Schiff.

Common up to 2000 feet.

Margarodes unionalis, Hb.

Not uncommon.

Diasema ramburialis, Dup.

Fairly common.

Crambus atlanticus, Woll.*

"Alis anticis apice acutis, saturate griseo-ochreis, costa anguste albida, dorso basim versus albido, vitta centrali albida a basi perducta, pone medium in ramos, fracta plagaque fusca interrupta, plaga hæc postice nigro et albido marginata est; palpis longiusculis; antennis filiformibus, nec pectinatis; capite vittaque centrali thoracica albis. Exp. alar. 13 lin. Inhabits Madeira proper; abounding in grassy spots during the summer months at intermediate and lofty elevations."

Primaries greyish ochre, with a moderately broad white longitudinal stripe from base to four-fifths length of wing, which broadens outwards, and, as the short diagnosis says, is broken into veins towards the costa, between which are dark dustings (visible only in fresh specimens); the ground colour from this stripe to the

* Ann. and Mag. Nat. Hist., 18[illegible], I., p. 119.

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inner margin is very much darker, often, in fact, ochreous brown. "Costa anguste albida." This is not at all constant. Hind margin darkly dotted. Fringes grey, with a double dividing line. Secondaries brownish grey, dark at the apex, becoming quite pale near the anal angle. Fringes whitish, with a dividing line. Palpi as long as head and thorax, white above, head white, thorax white, with chestnut patagiae; abdomen same colour as secondaries. The ♀ is similar to the ♂, but somewhat paler.

This species belongs to the *tristellus* and *selasellus* group, but is a finer and handsomer insect.

Enomene ocellea.

I have in Wollaston's collection two fine specimens, and have recently received others from Madeira.

Myelois cinerella, Sttn.

There are two fine specimens of this insect in the National Museum. Mr. Stainton says (Ann. and Mag. Nat. Hist. 1859, 3rd ser., III., p. 211) it is not closely allied to any known species, and inhabits the Northern Dezerta. His diagnosis is as follows:—

"Alis anticis angustulis dilute griseo-ochreis, fusco valde suffusis striga priore obliqua, posteriore sinuata, ciliis dilute griseo-ochreis. Exp. alar. 10—11 lin. An obscure-looking insect, not closely allied to any known species; the labial palpi are unusually short, and the median vein of the posterior wing is trifid, as in *M. compositella.*"

Ephestia gnidiella, Mill.

A few specimens, which present no unusual features.

Ephestia interpunctella, Hb.

Abundant at Funchal.

Galeria melonella, L.

Common; one specimen is very remarkable, being almost black.

Achræa grisella, F.

One or two specimens, which differ in no way from the ordinary type.

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THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1894.

February 7th, 1894.

HENRY JOHN ELWES, Esq., F.L.S., President, in the chair.

Donations to the Library were announced and thanks voted to the respective donors.

Nomination of Vice-Presidents.

The President announced that he had nominated the Rt. Hon. Lord Walsingham, LL.D., F.R.S.; Professor Edward B. Poulton, M.A., F.R.S.; and Colonel Charles Swinhoe, M.A., F.L.S., Vice-Presidents of the Society for the session 1894-95.

Election of Fellows.

Mr. Walter F. Baker, of 18, Hyde Terrace, I
Percy M. Bright, of Roccabruna, Bournemou
Lewis Compton Miall, F.R.S., of the York

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Leeds, and Mr. Edwin Wilson, of Cherry Hinton, Hons., Cambridge, were elected Fellows of the Society.

Exhibitions, &c.

Mr. Jenner Weir exhibited, on behalf of Mr. [illegible], a specimen of *Plusia moneta*, Fabr., which had been captured at Christchurch, Hants, and remarked that this species, which had been found in this country for the first time so recently as June, 1890, was apparently becoming a permanent resident here, as it had been since taken in several of the southern counties. The food-plant, *Aconitum napellus*, though rare in England as a wild plant, was very common in gardens. Mr. Jenner Weir also exhibited a nearly black specimen of *Vanilla macularia*, L., the yellow markings being reduced to a few small dots.

Mr. Hamilton Druce exhibited a female specimen of *Hypochrysops scintillans*, lately received by him from Miloki, New Ireland. He said that only the male of this species had been as yet described.

Mr. F. Enock exhibited a nest of the British Trap-door Spider, *Atypus piceus*, recently found near Hastings by Mrs. Enock.

Mr. W. F. H. Blandford stated that he had recently obtained an additional species of *Scolyto-platypus* from Japan, which, though closely allied to the species he had formerly described, showed a very distinct modification of the male prosternum.

Mr. M. Jacoby exhibited and remarked on a specimen of *Leptispa pygmæa*, Baly, which was doing much injury to sugar-cane in the Bombay Presidency of India. Mr. G. C. Champion stated that he had found an allied species on bamboo.

Papers read.

Dr. F. A Dixey read a paper—which was illustrated by the oxyhydrogen lantern—entitled "On the Phylogeny of the *Pierinæ* as illustrated by their wing-markings and geographical distribution." A long discussion ensued, in which the President, Mr. Osbert Salvin, Mr. Jacoby, Colonel Swinhoe, Mr. Jenner Weir, Mr. Hampson, and Mr. Kenrick took part.

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Dr. T. A. Chapman read a paper entitled "Some notes on those species of Micro-Lepidoptera, allied to *Micropteryx*, whose larvæ are external feeders, and chiefly on the early stages of *Eriocephala calthella*." Mr. Hampson and the President made some remarks on the subject of the paper.

Mr. Hamilton H. Druce read a paper entitled "Description of the female of *Hypochrysops scintillans*, Butl."

The Rev. Dr. Walker communicated a paper by Mr. R. H. F. Rippon, entitled, "Description of a variety of *Ornithoptera* (*Priamoptera*) *urvilliana*."

February 28th, 1894.

Colonel Charles Swinhoe, M.A., F.L.S., Vice-President, in the chair.

Donations to the Library were announced and thanks voted to the respective donors.

Election of an Honorary Fellow.

Professor August Forel, M.D., of the University of Zürich, was elected an Honorary Fellow of the Society, to fill the vacancy caused by the death of the late Professor H. A. Hagen, M.D.

Elections of Fellows.

Mr. John Pratt, of the Cedars, New Barnet, and Mr. Michael Yeatman Woolf, of 1, Marlborough Place, St. John's Wood, N.W., were elected Fellows of the Society.

Exhibitions, etc.

Mr. G. C. Champion called attention to a supposed new Longicorn Beetle, described and figured by Herr A. F. Nonfried, of Rakonitz, Bohemia, under the name of *Callipogon friedlanderi*, in the Berl. Ent. Zeitschr. 1892, p. 22. He said that the supposed characters of the insect were due to the fact that the head had been gummed on upside down! He also exhibited an extensive collection of Coleoptera and

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Hemiptera-Heteroptera made by himself in the island of Corsica in May and June last.

The Rev. Theodore Wood exhibited a variety of *Saturnia carpini*, with semi-transparent wings, a large proportion of the scales being apparently absent, bred with several examples of the type-form at Baldock, Herts; also a pale variety of *Smerinthus populi*, which was said to have been bred, with several similar specimens, from larvæ marked with rows of red spots on both sides.

Mr. R. South exhibited a variety of *Argynnis aglaia*, approaching the form known as var. *charlotta*, and a variety of *Euchelia jacobeæ*, in which the crimson costal streak was continued along the outer margin almost to the inner margin, taken by Mr. Fowler at Ringwood, Hants, in 1893; a variety of *Argynnis euphrosyne*, taken by Mr. Mead in Epping Forest, in 1893; and a series of black and other forms of *Phigalia pedaria*, bred during the present year from a black female captured last spring by Mr. Rose, of Barnsley.

Mr, South also exhibited, on behalf of Dr. H. G. Knaggs, working models of the mechanical decoy and spring net described by the inventor in the Entomologist xxvi., pp. 154—157, 180—182, 207—210. He remarked that, although the apparatus might appear somewhat complicated in character, it would be found on examination to be really simple in construction. It could be quickly fixed up for use, readily taken apart again, and when packed the whole of the spring net could be stowed away in a bag measuring only twenty-six inches in length, and eight and a half inches in girth.

So far the contrivance had not been tested in the field, but on one occasion Dr. Knaggs had fitted it up on his lawn in Camden Road, and caught a specimen of *Pieris brassicæ*. It would probably be found of the greatest use to collectors of Lepidoptera in tropical countries. If specimens of a desired species were attracted by the decoy within the area commanded by the net their capture would be certain, as the action of the springs was so rapid that the fastest flying butterfly would have little chance of escape.

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Colonel Swinhoe suggested that a dead animal might be used as an attraction instead of the decoy.

Mr. H. Goss exhibited, for Mr. C. B. Taylor, of Jamaica, a coloured drawing of the larva of *Papilio homerus*, Fab.

Mr. F. W. Frohawk exhibited drawings showing the complete life-history of *Argynis aglaia* and *A. adippe*, every stage being figured; also enlarged drawings of the segments of the larvæ in their first and last stages, showing the remarkable difference in structure. Mr. Merrifield commented on the beauty of the drawings.

Papers read, etc.

Mr. G. C. Champion read a paper entitled "On the *Tenebrionidæ* collected in Australia and Tasmania by Mr. J. J. Walker, R.N., during the voyage of H.M. ship 'Penguin,' with descriptions of new genera and species," and he exhibited the specimens comprised in the collection. Mr. J. J. Walker and Colonel Swinhoe made some remarks on the paper.

Mr. Champion also read a paper entitled "An Entomological Excursion to Corsica," in which he described an expedition to the mountains of that island in May and June, 1893, in company with Mr. R. S. Standen, Mr. A. H. Jones, Colonel Yerbury, R.A., Mr. Lemann, Mr. Raine, and others. The author stated that Mr. Standen had already given an account of the Lepidoptera (Rhopalocera) in the "Entomologist," 1893, pp. 236—238, and pp. 259—263.

Mr. Osbert Salvin, Colonel Yerbury, and Colonel Swinhoe took part in the discussion which ensued.

Mr. Edward Saunders communicated a paper entitled "A List of Hemiptera-Heteroptera collected by Mr. Champion in Corsica, with a description of one new species."

Mr. W. F. Kirby read a paper entitled "Notes on *Dorydium westwoodi*, Buchanan White, with observations on the use of the name Dorydium."

Mr. Charles B. Taylor communicated a paper entitled "Description of the larva and pupa of *Papilio homerus*, Fab."

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March 14th, 1894.

Colonel Charles Swinhoe, M.A., F.L.S., Vice-President, in the chair.

Donations to the Library were announced and thanks voted to the respective donors.

Election of Fellows.

Mr. William Bateson, M.A., Fellow of St. John's College, Cambridge; Mr. H. Caracciolo, of the Port of Spain, Trinidad, West Indies; Mr. G. C. Dudgeon, of 53, Montague Square, W.; and the Rev. Frank E. Lowe, M.A., of St. Stephen's Vicarage, Guernsey, were elected Fellows of the Society.

The Westwood Bequest.

The Secretary read the following letter on the subject of the Westwood Bequest, received by the Treasurer from Miss Emma Swann, Professor Westwood's niece.

"141, Woodstock Road, Oxford.
"*February* 17*th*, 1894.

"Dear Sir,—I beg to enclose to you, as Treasurer of the Entomological Society, a cheque for £250, payable to yourself, from Miss Lucy Swann and myself.

"This sum, in accordance with the wish we expressed in our first communication to your Society, to be invested as a separate sum, and not to enter into the general funds of the Society; and the income arising from it to be applied, either annually or every two years, as the Council may deem best, in paying for Entomological engravings or illustrations to be published in your Transactions, every such illustration to bear the inscription, "Westwood Bequest," and a copy of each Transaction containing a "Westwood Bequest" illustration, to be given to us.—I remain, Sir, yours faithfully,

"Emma Swann.

"Robert McLachlan, Esq., F.R.S."

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Exhibitions, etc.

Dr. D. Sharp exhibited a collection of White Ants (*Termites*) formed by Mr. G. D. Haviland in Singapore, which comprised about ten or twelve species, of most of which the various forms were obtained. He alluded to the bearing of the specimens found by Mr. Haviland on the question recently discussed by Mr. Herbert Spencer and Professor Weismann, as to the mode of development of the various forms of individuals of social insects. Mr. Spencer, he said, considers that these are due to nutrition at a later stage of the development than that at which the sex of the individual is determined. Dr. Sharp added that Professor Grassi has quite recently informed us that he has found, as the result of seven years' observations on the two European Termitids, *Calotermes flavicollis* and *Termes lucifugus*, that these white ants obtain, when necessary, workers and soldiers from individuals destined in the ordinary course to become perfect insects, and that they do this by varying the quantity and quality of the food supplied to the creatures that are to be thus deviated from the normal course of their development. In some cases, the Termites thus produce what Grassi calls neoteinic queens, that is fertile females, that in some portions of the development of the body still retain the immature condition; this transformation the white ants can effect at more than one stage of the life-history, but, nevertheless, it would appear that they prefer to operate at a particular stage. Mr. Haviland's collection contains examples of these neoteinic queens, he having found in one nest, instead of a single normal queen, eleven of these neoteinic individuals, thus confirming Grassi's statement, that when the ants produce these "substitution royalties," they operate on numerous couples, which are ultimately reduced to a single pair. Mr. Haviland's neoteinic queens were accompanied by neoteinic kings, and these, according to Mr. Haviland, behaved in a similar manner towards their consorts as perfect kings do to perfect queens. The collection made by Mr. Haviland consists of ten or twelve species, of most of which a great proportion of the forms was obtained; the kings and queens

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having been procured as well as workers, soldiers, winged individuals, and the immature forms.

Mr. Haviland gave an account of the manner in which he examined the nests so as to find the royal couple, which he stated frequently required some hours of search. There is great variety in the habits of the Termitidæ, and Mr. Haviland observed that at least one species wanders at large after the manner of the Hymenopterous ants; this it does at night, and individuals of this species may be found returning in the morning to their nest, the workers carrying balls of food, and being escorted by soldiers, who, however, carry no food. Mr. Haviland further stated that one or two of the Singapore species made use of mushrooms, which were growing in chambers near their nests, after the manner described by Smeathman in the Philosophical Transactions of the Royal Society. He had examined the alimentary canal and found spores of these fungi therein. Mr. Haviland mentioned that in the case of a species which is at present committing great havoc in the Museum at Singapore, he had not been able to find the reproductive individuals.

Colonel Swinhoe said that it was generally considered in India, that the fertile females were never found in human habitations, even when these were much infested by the Ants.

Mr. H. Goss remarked that the fact that the different forms of social insects were produced by nutrition was apparently known to Virgil, who, he believed, referred to it, and to the subject of Parthenogenesis in Bees, in the "Georgics," Book iv. Mr. McLachlan, Colonel Swinhoe, Mr. Champion, Mr. Jenner Weir, and Dr. Sharp continued the discussion.

Mr. O. E. Janson exhibited specimens of *Dicranocephalus adamsi*, Pascoe, from Sze-chuen, Western China, and *D. dabryi*, Auz., recently received from the neighbourhood of Moupin, in the same district; he observed that, although the latter had been quoted by Lucas, Bates, and others, as a synonym of *adamsi*, the two species were perfectly distinct; the females of both were unknown to the authors when describing them, and presented a remarkable difference, for whilst in *dabryi* this sex is similar to the male in colour and sculpture, in *adamsi* it is entirely dull black, with the upper surface minutely and densely punctate.

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Mr. C. O. Waterhouse exhibited, for Mr. E. A. Waterhouse, a specimen of *Colias edusa*, closely resembling *Colias erate*, a Continental species, which was taken on Wimbledon Common; a varied series of *Chrysophanus phlæas*, from Barnes Common; and a series of *Lycæna arion* from Cornwall.

Papers read, etc.

The Rev. Canon Fowler read a paper entitled "Some new species of *Membracidæ*."

Mr. F. Merrifield read a paper entitled "Temperature experiments in 1893, on several species of *Vanessa* and other Lepidoptera." He said that the winter-pupating brood of *Pieris napi*, like the summer-pupating brood, depends for its characteristic seasonal colouring partly, but by no means entirely, on the temperature to which the individual is subjected. *Pararge egeria* was rendered more vivid in its markings and colouring by low temperatures, but there was no approach to the bright South European form, either at high or at low temperatures. In *Cidaria silaceata* of the summer-pupating brood, low temperatures caused a resemblance to the winter-pupating brood, high temperatures caused a duller and more uniform appearance, and reduced the size. In *Araschnia levana*, the brood reared from eggs laid in the spring, high temperatures in every case produced the blackish normal summer or *prorsa* form, while severe cold in every instance transformed the insect completely into the bright fritillary-coloured spring or *levana* type. In *Vanessa polychloros*, to use the language of Dr. Dixey, who had examined the insects, forcing invariably tended to produce yellow, whether the pupa was previously warmed or cooled, and refrigeration produced increased breadth of the dark border, whether followed or not by forcing. By a succession of high and low temperatures, presumably ancestral markings were brought out in the shape of a faint sub-marginal chain on all the wings of yellowish cloudy spots with minute black centres. Some of the individuals subjected to severe cold were very dark and closely resembled *V. xanthomelas*. In *Vanessa atalanta* very high temperatures developed the golden brown parts, both in extent and brightness, new small scarlet spots

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beneath and, above, a scarlet cloudy patch on the forewings, between the large white costal spot and the third of the outer row of white spots, about which it tended to form a scattered ring. Low temperatures caused a great extension of the blue-green, lavender and white markings, and much suffusion. Some specimens obtained or bred under natural circumstances, but in very cold weather, and forwarded to him by Mr. J. J. Walker and Dr. Chapman respectively, showed effects similar to these, but considerably less in degree. In *Vanessa c-album* both the first or July emergence and the later or September emergence are affected by moderately low temperatures, but the former responds in a much greater degree than the latter; this seemed to be quite in accordance with Mr. W. H. Edwards' observations and experiments on the allied North American *Grapta interrogationis* and *Grapta comma*. In *Vanessa io* low temperatures disintegrated the ocellus on the forewing, reducing it to a chain of white spots, and brought out other presumably ancestral features. In *Vanessa antiopa* no results had been obtained, but this was perhaps owing to the pupæ being too old. The experiments generally confirmed the previous conclusions of the writer; but there was much more to be learned by further experiments in the same direction, and probably in the direction of other circumstances affecting the insects—moisture, foodplant, and possibly light, electricity, and magnetism, though as to the three last, such experiments as had yet been tried by the writer had produced no results.

Dr. F. A. Dixey read a paper entitled, "Mr. Merrifield's experiments in Temperature-variation as bearing on theories of Heredity," which was supplemental to the previous paper. The author said that the interest of Mr. Merrifield's experiments was much enhanced by the fact that many of the changes produced were of a reversionary character, and that the restored ancestral features differed with the nature of the disturbance. The present series of experiments not only confirmed former conclusions to this effect, but added new evidence of the same kind, reference to which was made by Dr. Dixey in detail, with the help of diagrams.

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The question might still be raised whether these were, after all, genuine cases of reversion, or whether they were not simply to be explained as the like effects of like causes, produced *de novo* in both ancestor and descendant. The latter supposition, no doubt, was sufficient to account for some of the phenomena observed; but there was a residuum, comprising the more special reversionary features, which could hardly be so explained. What was the bearing of these latter on the general doctrine of reversion? Current explanations of atavism as a result of disturbance were inadequate, inasmuch as they gave no real reason why the more recently-established features should be less stable than those with a longer ancestral history behind them. As to the two more definite explanations afforded by the theories of Darwin and Weismann, there was no doubt that if Darwin's hypothesis of centripetal gemmules were granted, the most usual cases of atavism (those following hybridisation) could be explained under the theory of pangenesis. The present cases, however, stood on a quite different footing, as the new conditions determining atavism were only applied at an advanced period in the life of the individual, and had no reference to the ovum from which that individual originated. On the other hand, it seemed that if Weismann's theory of centrifugal carriers of heredity were assumed, the present instances could be explained as being due to the critical influence of abnormal temperature-conditions on what Weismann called "the struggle of the ids in ontogeny"; the new external conditions favouring some of the ancestral determinants (which *ex hypothesi* exist in the germ plasm) at the expense of those more proper to the species.

Certain observations seemed to show that some, at least, of these features might be hereditary; and it would be most desirable to ascertain whether this were so with all or most of them. Their transmission, though not their first appearance, could be accounted for by pangenesis; but under the rival hypothesis it would be necessary—in these cases of heredity—to postulate, as Weismann now does, a direct effect upon some of the determinants wherever they occur, ever-

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the germ-plasm itself. If *all* could be shown to be hereditary, it would seem to follow that the supposed influence upon the struggle of the ids was really inoperative, but the issue would still remain open between pangenesis and a direct modification of the determinants in the germ-plasm. If some, as seemed probable, turned out to be non-transmissible, the effect might be tried of varying the period in the ontogeny during which the disturbance was applied, with the view of ascertaining whether the intervention of new conditions at different stages of the struggle of the ids would not produce different results.

In conclusion, Dr. Dixey pointed out the importance of a well-established phylogeny as a basis of investigation, since it was only in groups of which the phylogeny was known that the ancestral character of these variations could be pronounced upon with certainty. For many reasons the Lepidoptera formed a peculiarly suitable group for such experiments, which might fairly be expected to throw much additional light on the complex subject of heredity.

Colonel Swinhoe referred to Dr. Dixey's remarks as to the phylogeny of *Argynnis* and *Vanessa*, and asked if he considered the male or the female of *Argynnis niphe* the older form.

Mr. Hampson pointed out that the peculiar aspect of *A. niphe* ♀, was generally attributed to mimicry of *Danais chrysippus*, though he was not himself prepared to endorse that opinion.

Colonel Swinhoe thought that the facts of the distribution of the two insects were not incompatible with the supposed mimicry.

Dr. Dixey, in reply, said that he believed the marginal and apical areas of dark ground colour in *A. niphe* ♀, were of more ancient origin than the tawny colour of the male. The special features of mimics were often retained rather than acquired, and whether *A. niphe* were a mimic or not, he should be inclined to consider these areas as relics of an ancestral feature. The evidence as to the original dark ground colour of *Argynnis* was cumulative, and he begged to refer to his paper in Trans. Ent. Soc. Lond., 1890, pp. 102-105, for a fuller discussion of the question.

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March 28th, 1894.

Henry John Elwes, Esq., F.L.S., President, in the chair.

Donations to the Library were announced and thanks voted to the respective donors.

Election of a Fellow.

Mr. Percy H. Grimshaw, of 58, Comiston Road, Edinburgh, was elected a Fellow of the Society,

Death of Mr. J. Jenner Weir.

Mr. McLachlan announced the sudden death, on the 23rd inst., of Mr. J. Jenner Weir, who joined the Society in 1845, and had been one of its most regular attendants. He also commented on the scientific attainments of the deceased, and his social qualities. Mr. Goss and Mr. Merrifield also spoke of their long friendship with the deceased, and of the respect and esteem which they entertained for his varied knowledge and amiability of disposition.

Exhibitions, etc.

Mr. W. Borrer, jun., exhibited a wasp's nest which had been built in such a way as to conceal the entrance thereto and to protect the whole nest from observation. He believed the nest to be that of *Vespa vulgaris* (*cf.* Proc. Ent. Soc. London, 1892, pp. xx and xxi). Mr. McLachlan and Mr. Blandford made some remarks on the subject.

Mr. G. F. Hampson exhibited a specimen of *Gandaritis flavata*, Moore, from the Khási Hills, and called attention to the existence in the males of this species, in the closely allied British species *Cidaria dotata*, Linn., and also in two Japanese species (*C. agnes*, Butl., and an undescribed species), of an organ on the under side of the forewing, which he suggested might be for stridulation; this organ consisting of a small scar of hyaline membrane situated just below the middle of vein 2, which is much curved: this scar is fringed with long hair, and has running down its middle a row of sharp spines situated on the aborted remains of vein 1a which is curved close up to vein 2; the spines wou

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rally rub against part of the costa of the hindwing, but no spines or unusual roughening seem to exist on that or on any of the veins on the upper side of the hindwing against which they could strike; below the scar is situated a large shallow fovea or pit in the membrane, slightly developed in *dotata* and *flavata*, but much more prominently in the two Japanese species, and, should the organ prove to be for stridulation, it would probably act as a sounding-board. Mr. Hampson said that in the Japanese species *C. fixseni*, Brem, exceedingly closely allied to *flavata*, the males have no trace of this organ; and he hoped that entomologists who have an opportunity of observing *dotata* in life would make some experiments on living specimens during the ensuing summer; probably confining males and females together would lead to some results. The President, Prof. E. B. Poulton, Lord Walsingham, and Mr. Hampson took part in the discussion which ensued.

Papers, etc., read.

The Rev. T. A. Marshall communicated a paper entitled "A Monograph of the British Braconidæ, Part V."

Mons. Louis Péringuey communicated a paper entitled "Descriptions of new Cicindelidæ from Mashunaland."

Prof. Poulton gave an account of his recent tour in the United States, and commented on the entomological and other collections contained in the American museums. Lord Walsingham, Mr. Hampson, and the President also made some remarks on the subject.

April 11th, 1894.

Henry John Elwes, Esq., F.L.S., President, in the chair.

Donations to the Library were announced and thanks voted to the respective donors.

Election of Fellows.

Mr. Frederic Whitworth Jones, of 63, Carlton Hill, N.W., and Dr. William Steer Riding, B.A., M.D., of Buckerell, Honiton, Devon, were elected Fellows of the Society.

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Exhibitions, etc.

The Hon. Walter Rothschild exhibited male and female specimens of *Ornithoptera paradisea*, Stdgr., from Finisterre Mountains, New Guinea; *O. trojana*, Stdgr., from Palawan; *O. andromache*, Stdgr., from Kina Balu, Borneo; *Œnetus mirabilis*, Rothsch., from Cedar Bay, Queensland; and a few other splendid species from the Upper Amazons. The President, Mr. J. J. Walker, Mr. Osbert Salvin, Lord Walsingham, Colonel Lang, R.E., Mr. Champion, and Mr. Hampson made remarks on the geographical distribution of some of the species and the elevation at which they were taken.

Mr. H. Goss exhibited, for Mr. G. A. J. Rothney, several specimens of a species of Hemiptera (*Serinetha augur*, Fab.), and of a species of Lepidoptera (*Phauda flammans*, Walk.), the latter of which closely resembled and mimicked the former. He said that Mr. Rothney had found both species abundantly on the roots and trunks of trees in Mysore, in November last, in company with Ants (several species of *Camponotus* and *Cremastogaster*). The Hemiptera appeared to be distasteful to the Ants, as they were never molested by them, and he thought that the species of Lepidoptera was undoubtedly protected from attack by its close imitation of the Hemipteron. Mr. Goss said he was indebted to Mr. C. J. Gahan for determining the species. A discussion followed on the mimicking species, in which the President, Mr. Waterhouse, Mr. J. J. Walker, Colonel Swinhoe, Mr. Hampson, and others took part.

Mr. J. W. Tutt exhibited (1) a type specimen of *Lycæna corydon*, captured in July, 1893; (2) a hybrid male (*L. corydon* and *L. adonis*), taken *in copulâ* with a typical female *L. adonis*, May 20th, 1893; (3) a typical male *L. adonis*, May 20th, 1893; (4) a female *L. adonis*, the pigment failing in one hind-wing; (5) a pale var. of *L. corydon*, probably to be referred to var. *apennina* of Zeller, usually taken in Italian mountains, or var. *albicans*, H. S., taken in Andalusia. Mr. Tutt remarked that, of the first, Staudinger (Cat. p. 12) says "pallidior," of the latter "albicans." He also remarked that the hybrid retains the external features of the species *corydon*, but has taken on to a great extent the coloration of

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L. adonis. It was captured *in copulâ* with a female *L. adonis*, at a time when *L. adonis* was very abundant, and some weeks before *L. corydon* occurred (*vide* Ent. Record, iv., p. 230).

The question having been raised by the President as to the number of meetings of the Society which it was desirable to hold during the year, and the most convenient dates for such meetings, a long discussion on the subject ensued, in which Mr. Waterhouse, Mr. Salvin, the Hon. Walter Rothschild, the Rev. T. Wood, Mr. S. Stevens, the Rev. Seymour St. John, and others took part.

May 2nd, 1894.

Henry John Elwes, Esq., F.L.S., President, in the chair.

Donations to the Library were announced and thanks voted to the respective donors.

Exhibitions, etc.,

Mr. S. Stevens exhibited a specimen of *Argynnis aglaia* var. *charlotta*, taken by the late Rev. James Watson in the New Forest in 1870.

Mr. J. A. Clark exhibited a curious variety of *Chelonia caja*, having an extraordinary wedge-shaped marking extending from the outer margin to the base of the left hindwing, and also, on the same wing, a small spot. It was brown and white in colour, and had the appearance of having been taken from the forewing and inserted in the hindwing. The specimen was said to have been taken at Abbotts Wood, Sussex, in July, 1892.

Prof. E. B. Poulton exhibited living specimens of the larvæ of *Gastropacha quercifolia*, surrounded respectively during the early stages of growth by black twigs and lichen-coloured twigs, the food being the same in both cases. All the larvæ were shown upon a white paper back-ground, but examples of the surrounding twigs which produced the change of colour were shown beside each batch. Mr. Merrifield made some remarks on the subject.

Papers read.

Mr. E. Meyrick communicated a paper entitled "On *Pyralidina* from the Malay Archipelago."

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Mr. C. J. Gahan read a paper entitled, "A Supplemental List of the Longicorn Coleoptera obtained by Mr. J. J. Walker, R.N., during the voyage of H.M.S. 'Penguin.'"

Special General Meeting.

Prof. E. B. Poulton, Vice-President, then took the chair, and a Special General Meeting, convened under Chap. XVIII. of the Bye-Laws, in compliance with the following request, was held:—

"*To the President and Council of the Entomological Society.*

"We, the undersigned Fellows of the Entomological Society, require you to convene a Special General Meeting of the Society on Wednesday next, the 2nd May, 1894, at 8.30 p.m., or so soon thereafter as the business of the Ordinary Meeting, to be held on that day, shall have been brought to a conclusion, for the purpose of obtaining the approval, by the Society, of the action taken by the Council, in declining to interfere in private disputes between Fellows of the Society.

"Osbert Salvin.
"F. D. Godman.
"W. F. H. Blandford.
"C. J. Gahan.
"H. Goss.
"G. C. Champion.

"25*th April*, 1894."

Professor Poulton having addressed the Meeting, Mr. A. B. Farn made some remarks.

Mr. C. G. Barrett then moved the following resolution:—"That this Society approves the action of its Council in refusing to consider it a part of its duties to judge of disputes between the Fellows." This was seconded by Mr. Waterhouse.

Mr. Arthur Robinson and Mr. G. T. Bethune-Baker having spoken in support of the resolution, it was put to the vote by the Chairman and carried unanimously. The Proceedings then terminated.

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June 6th, 1894.

Henry John Elwes, Esq., F.L.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Fellows.

Dr. K. Jordan, of "The Museum," Tring, and the Honble. Nathaniel C. Rothschild, of Tring Park, Tring, were elected Fellows of the Society.

Exhibitions, etc.

Mr. W. F. H. Blandford exhibited a series of eleven male specimens of *Rhina barbirostris* from British Honduras, of which the largest and smallest examples measure respectively 60 and 17 mm. The difference in bulk, supposing the proportions to be identical, is as 48 to 1. He remarked that this variation of the size is especially common in the *Brenthidæ*, *Cossonidæ*, and other wood-boring Coleoptera. The President, Dr. Sharp, the Rev. Canon Fowler, Mr. Jacoby, the Honble. Walter Rothschild, Mr. Merrifield, and Mr. Champion took part in the discussion which ensued.

Mr. A. J. Chitty exhibited specimens of *Cardiophorus equiseti* taken near Braunton, on the north coast of Devon, in May, 1891. Mr. Champion and Mr. Blandford made some remarks on the species.

Mr. McLachlan exhibited for Mr. J. W. Douglas, male specimens of a Coccid (*Lecanium prunastri*), bred from scales attached to shoots of blackthorn (*Prunus spinosa*) received from Herr Karel Sulc, of Prague. Mr. Douglas communicated the following notes on the species. "On the 10th May "last, the males appeared out of scales attached to the shoots "of blackthorn (*Prunus spinosa*), received on the 9th from Herr "Karel Sulc, of Prague. These males have no special salient "characters, but their white scales are very easy to differen- "tiate from those of congeneric species, for instead of being "smooth and translucent, they are opaque and covered with "small granulations."

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" In the 'Annales de la Société Entomologique de France,' " iii, 211 (1884), under the name of *Coccus prunastri*, Boyer " de Fonscolombe briefly described the ♀ scales only, but " Signoret, in 1872 (*op. cit.*, Essai sur les Cochenilles, p. 253), " fully redescribed both the ♀ scale and the enclosed insect, " and also noticed the ♂ scales, but they, he says, were too " immature for him to study. The perfect insect has not " hitherto been seen, or at least its appearance has not been " recorded. There are also some mature ♀ scales of a pre- " vious year, which were sent detached from the shoots. " The species is common on blackthorn in France and Ger- " many, and should surely be found in Britain."

Lord Walsingham exhibited a series of *Cacoecia podana*, Scop., reared from larvæ feeding on *Lapageria* and palms in Messrs. Veitch's conservatories in King's Road, Chelsea, including some very dark (melanic) varieties. The Honble. Walter Rothschild stated that he had taken the species on lime. Mr. Hampson and Mr. Tutt also made some remarks on the habits of the species.

Mr. C. Fenn exhibited a long series of *Selenia lunaria*, bred from one batch of eggs, which included both the spring and summer forms; and also two unforced specimens, which emerged in November. He remarked that the variation between the two emergences, viz., spring and summer, is considerable, and also the range of variation *inter se*, especially in the spring form; but it is very remarkable that the summer form has one or two representatives among the specimens of the spring emergence. The division of the sexes in the time of appearance was also peculiar. Mr. Fenn stated that in August, 1893, 19 individuals were bred, 18 ♀, 1 ♂. Two ♀ examples appeared in November, and the spring brood began to come out in April. The first 20 bred were all females, but among the 40 which subsequently emerged, the sexes were evenly distributed. He said that the parent female was taken at Bexley in May, 1893.

Mr. F. Lovell Keays exhibited, on behalf of Mr. Arthur Lovell Keays, a variety of *L. alexis* (female), having the marginal ocelli on the hind wings entirely without the usual orange-coloured lunules. The specimen was captured at

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Caterham, on May 22nd, 1894, and was the first example of the species observed by the captor this season. Mr. Barrett and the Honble. W. Rothschild made some remarks on the specimen.

Mr. J. H. Durrant exhibited a series of *Steganoptycha pygmæana*, Hb., taken at Merton, Norfolk, between the 25th March and the middle of April last. Lord Walsingham made some remarks on the species.

Mr. H. Goss read an extract from a report from Mr. J. R. Preece, H.M. Consul at Ispahan, to the Foreign Office, on the subject of damage caused to the wheat crop in the district of Rafsinjan, by an insect which was called "Sen" by the natives, and which he described as like a flying bug, reddish olive in colour, with heavy broad shoulders. Mr. Goss said he had been asked by Mr. W. H. Preece, C.B., to ascertain, if possible, the name of the species known to the natives as "Sen." Dr. Sharp said that in the absence of a specimen of the insect, it was impossible to express an opinion as to the identity of the species.

The Rev. Canon Fowler exhibited, for Miss Ormerod, specimens of *Diloboderus abderus*, Sturm, *Eucranium arachnoides*, Brull., and *Megathopa violacea*, Blanch., which she had received from the La Plata district of the Argentine Territories, where they were said to be damaging the grass crops. He also read the following notes from Miss Ormerod on the subject :—

"Torrington House,
"St. Albans,
"*June 5th*, 1894.

"Dear Canon Fowler,—

"I have recently received from Mr. Hy. Watts, Secretary of the South American Land Company, specimens of some beetles which are attacking the grass on their enclosed land in the La Plata district of the Argentine Territories, and of which, as far as I am aware, the habits appear to have been very little recorded.

"The information sent was that in a dry spring a white grub did serious damage to the roots of the grasses. The

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larvæ (of which specimens were sent, showing them to be Lamellicorn), were stated to be 1½ inches long, ⅝ths inch diameter; body round, with reddish head; and it was said that later on thousands of a kind of horned beetle (presumably developed from these larvæ) appeared out of the infested ground.

"This is all very plain; but the thing that was not clear to the local manager, who appears to be a very good observer, is—why do the injuries to grass, and also the beetle presence (of whatever species), *not* occur on the unenclosed Pampas, but only, or almost entirely, within the enclosures? and why should the destruction of grass be followed by such a growth of better kinds, that the infestation was decidedly ultimately a benefit?

"I found from the notes sent me that the great enclosures were especially used for grazing stock, as cattle, horses, and sheep, and it was mentioned, 'Every year we have a good crop of beetles, which, at certain seasons, you find travelling along the cattle tracks in hundreds. It appears to be from their eggs that the white grub comes.

"On turning out the contents of the bottle, I found that most of the contents were ♂ and ♀ of one of the *Dynastidæ*, but with them were single specimens of what I took to be *Scarabæidæ*, but had no means here of determining; therefore I asked Mr. Janson's assistance, who was good enough to identify the first (the *Dynastes*) as ♂ and ♀ of the *Dilobodérus abderus*, Sturm; and the two other species, of which, unfortunately, only one specimen of each was sent me, respectively the *Eucranium arachnoides*, Brullé, and the *Megathopa violacea*, Blanch. In the case of this latter, Mr. Janson drew my attention to the colour being usually of a more marked violet than that of my specimen; but still as the preservative fluid has dried out, the violet colour is not wholly absent.

"The *E. arachnoides* will be seen to be a very beautiful specimen, the peculiar fork, or pair of long processes, in front of the clypeus, being very observable. On seeing these two beetles, it occurred to me that they might account, to some extent, for the improved state of the ground. If they are of the manure-burying kinds, this (so to say) 'dibbling'

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in enrichment all about the pasture land could not fail to be serviceable. The point, however, of the respective agricultural habits of the beetles is what I should greatly like to be allowed to bring under the notice of the meeting.

"With the manure-burying beetles we might have a straightforward process of the larvæ doing mischief at the roots of the grass, but, at the same time, of the manure helping to throw up a good new growth; but the case does not seem clear as to the *Dynastes*, the *Diloboderus abderus*. The note sent of the ravage is not clearly applicable especially to any one of the species sent. It says, 'They literally dug up the earth, leaving it as loose as if a spade had been used;' and 'they work within a couple of inches of the surface, eating the roots of all the grass they find.' But though we have a note of the horned beetles coming up by thousands from the destroyed pasture, it seems to me we want observation as to whether the two other kinds may not also be present. I know that in Caffraria, the Keever beetle, *Heteronychus arator*, Fab. (? Burm.) (one of the *Dynastidæ*) does a great deal of mischief, especially to wheat; and from notes sent me by Mr. Fred. R. Schauble, of Stortge, bites off the crops about an inch underground; but any information as to where a published record of the habits of our S. American pasture beetles are to be found, would be a great help to unravelling the observations now on hand, and would be of very serviceable interest agriculturally as well as entomologically.—Yours very truly,

"Eleanor A. Ormerod, F.E.S."

Mr. Hampson raised an important point as to what was the legal "date of publication" of Part I. of the Transactions of the Society, 1894. He pointed out that the question of the priority of the names of certain new species described therein would depend upon the date of publication. Dr. Sharp asked Mr. Hampson to explain what he meant by "publication." Mr. Hampson replied.

The Honble. W. Rothschild said that he had been informed that when a copy, or five or six copies of the Transactions

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of a Society, have passed into the museum of a country, that is publication. Mr. McLachlan said he believed that when any book was "on sale" that book was published.

Mr. Goss explained the reason for the delay in the issue of Part I. of the Transactions, 1894.

The Honble. W. Rothschild suggested that immediately a Part was printed one or two copies should be sent to the publisher for sale. Dr. Sharp pointed out the practical difficulty of fixing the date of publication. Lord Walsingham and Prof. Poulton continued the discussion.

Mr. Hampson moved—

"That, having regard to the Secretary's statement, the date of publication of Part I. of the Transactions of 1894, should be fixed at 2nd May, 1894."

This motion was seconded by the Honble. W. Rothschild.

Prof. Poulton moved as an amendment—

"That the Secretary be instructed to ascertain the date on which the Part was sent to the Publishers, and that that should be fixed as the date governing priority."

Mr. Verrall then moved, as a further amendment—

"That the matter be referred to a committee, to consist of the Treasurer (Mr. McLachlan), the Honble. W. Rothschild, and Mr. Hampson."

This motion was seconded by Mr. R. W. Lloyd, and carried by a large majority.

Paper read.

Professor Franz Klapálek, of Prague, communicated a paper entitled, "Descriptions of a new species of *Raphidia*, L., and of three new species of Trichoptera from the Balkan Peninsula, with critical remarks on *Panorpa gibberosa*, McLach."

Special General Meeting.

Lord Walsingham, Vice-President, then took the chair, and a Special General Meeting, convened under Chap. XVIII. of the Bye-Laws, in compliance with the following request, was held:—

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"*23rd April*, 1894.

"GENTLEMEN,—

"We, the undersigned Fellows, request, in accordance with Chap. XVIII. of the Society's Bye-Laws, the President and Council of the Entomological Society of London to convene a Special General Meeting to consider:—

"(1) The matter of Mr. Farn's Circular of April 14th.

"(2) Whether any amendment of the Bye-Laws is necessary in consequence.

"We are, Gentlemen, yours faithfully,

"(Rev.) J. GREENE, M.A.
"FREDK. C. ADAMS.
"R. A. DALLAS-BEECHING.
"W. H. BLABER.
"JOHN E. ROBSON.
"C. FENN.

"To the SECRETARIES, Entomological Society of London,
"11, Chandos Street, Cavendish Square, W."

The Secretary, having read the above letter of request for a Special General Meeting, Lord Walsingham called upon one of the Fellows who had signed it to explain the objects for which the meeting had been convened.

Mr. Charles Fenn then offered some explanation of the objects of the request for the meeting.

Mr. Hampson made the following motion:—

"That this meeting wishes to express its strong disapproval of the printed circular sent round to the Fellows by Mr. Farn, and the imputations cast on the Council and President, and that having done this it declines to further consider the matter."

Mr. Bethune-Baker seconded this motion.

Mr. Farn, Mr. Elwes, Dr. P. B. Mason, Prof. Poulton, Mr. Tutt, Mr. Blandford, and Mr. Merrifield having spoken on the motion, the Chairman put the motion to the vote, and it was carried by a large majority. The Proceedings then terminated.

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October 3rd, 1894.

The Rt. Honble. Lord Walsingham, M.A., LL.D., F.R.S., Vice-President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of a Fellow.

Mr. Alick Marshall, of Bexley, Kent, was elected a Fellow of the Society.

Exhibitions, etc.

Mr. W. F. H. Blandford exhibited specimens of a sand-flea, chigoe or nigua, received from Mr. Szigetváry, of the Imperial Maritime Customs, China, who had found them in the ears of sewer-rats trapped at Ningpo. Mr. Blandford stated that the species was allied to, but perhaps not identical with, the American species, *Sarcopsylla penetrans*, L., one of the most troublesome pests in Tropical America and the West Indies to man and various domestic and wild animals, the female burrowing into the skin, usually of the feet, but also of any other accessible region. He said that the distribution of the chigoe was recorded over Tropical America and the Antilles from 30° N. to 30° S., and of late years it had established itself in Angola, Loango, and the Congo. Mr. Blandford also exhibited a series of Coleoptera from old collections, in a very dirty condition, of which half of the specimens had been cleaned by the rapid and effective process of immersing them in a solution of potassium hydrate. Colonel Swinhoe, Mr. McLachlan, Lord Walsingham, Mr. H. Goss, Mr. Champion, Mr. J. J. Walker, Mr. Barrett, and others, took part in the discussion which ensued.

Mr. F. C. Adams exhibited a specimen of *Mallota cristaloides*, a species of Diptera new to Britain, taken by himself in the New Forest on the 20th July last. He said that the species had been identified by Mr. Austen, of the British Museum, and that he had presented the specimen to the National Collection. Mr. Verrall made some remarks on the

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species and on the distribution of several allied species in the United Kingdom. Lord Walsingham, as a Trustee of the British Museum, expressed his satisfaction at the presentation of the specimen to that Institution.

Mr. Tutt exhibited specimens of *Zygæna exulans*, and read the following notes on the subject:—"The type of *Zygæna* "*exulans* is stated in Staudinger's *Catalog* to inhabit the "'Highest Alps and Pyrenees.' Its var. *vanadis*, Dalm., is "stated to be found in 'Lapland and the Scandinavian "'Mountains,' and is differentiated from the type as being "'parcissime squamata, albo non mixta.' The assumption "from this then is that the type is more thickly scaled and "mixed with white. In the last week of July, Dr. Chapman "found in the Alps (in the La Gráve district), at a consider- "able height, a form of *Zygæna exulans* well scaled, as the "species runs, and with the nervures and fore-legs of a decidedly "orange colour. The three specimens which he brought "away were large. A fortnight later, on a hill about 1000 "feet above Cogne, specimens were taken, dark in colour, fairly "well scaled, but without any pale nervures (apparently males). "A day or two later, more specimens were taken, similar to the "La Gráve district specimens, but with the nervures less orange "(apparently females), high up the Grauson Valley. Then, on "the 17th August, Dr. Chapman captured a large number in "the Grauson Valley, some dark and well scaled, without "the pale nervures, others generally less densely scaled with "strong white nervures and marginal line to anterior wings: "to a large extent these characters seemed sexual, but not "entirely so. Some years ago specimens of this species were "taken at Braemar, by Dr. Buchanan White, and owing to the "lack of scales which some of them showed, they were described "as a subdiaphanous form under the name of var. *subochracea*. "In 1886 Messrs. Tugwell and Lachlan Gibb captured a large "number of specimens, some of which were in moderate "condition, and it was very evident that Dr. White's varietal "name would hardly answer except for worn specimens. "During the past two years a very large number of specimens "have been captured (and some probably bred), and of these "I have seen a very considerable number. It is very evident

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"from these that the Scotch specimens in good condition exhibit "no difference from many of the Grauson insects. They pre- "sent the two ordinary forms, the well-scaled form without "the pale nervures and pale outer margin, and the form "less well scaled with these parts of the wing pale. I "exhibit Scotch specimens of each form. It would appear "that Staudinger was unaware of the existence of the "La Gráve form, in which the orange mixing is so prevalent, "and which seems a well defined local race. The form with "white markings (*teste* Staudinger) would appear to belong "principally to the female sex. Var. *vanadis* would appear "to be a rubbed form of the male, in which the scales have "been partially removed. The Scotch specimens recently "obtained, prove conclusively that in fine condition they are "as densely scaled as the Swiss specimens, and that most of "the specimens in our cabinets regarded as a subdiaphanous "variety ought to be named var. *rubbedaria*. It would ap- "pear easy to explain the rubbed condition of most of the "early-caught specimens. The insect is a regular sun lover, "and abounds locally on flowers in hot sunshine. In dull "weather, however, it is not at all easy to find specimens. In "Switzerland, sunshine is very frequent, and the consequence "is a collector gets a number of specimens as soon as they "have emerged. In Scotland there is comparatively but "little sun, and our collectors only went for an odd day now "and again, because of the nature of the locality. The "consequence is that they were very much more likely to "choose an unfavourable than a favourable day (most days "being of the former class), whilst the possibility of hitting "the exact day by an occasional visitor is only remote. Now "that our collectors stay in the locality, we get the specimens "as fine as they get them in Switzerland."

Mr. P. M. Bright exhibited a series of remarkable varieties of *Arctia menthastri* from N. Scotland, also series of *Liparis monacha* (including dark varieties) and *Boarmia roboraria* from the New Forest; *Zygæna exulans* from Braemar; *Noctua glareosa* from Montrose and the Shetlands; *Agrotis pyrophila* from the Isle of Portland, and Pitcaple, N.B.; red varieties of *Tæniocampa gracilis*; and a specimen of *Sterrha sacraria*,

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taken at light, at Mudeford, in October, 1893; also living larvæ of *Emydia cribrum*.

Mr. J. J. Walker exhibited a living specimen of a large species of Pulex, which he believed to be *Hystricopsylla talpæ*, Curtis, taken at Hartlip, Kent. Mr. Verrall and the Chairman made some remarks on this and allied species.

Papers read.

Mr. Kenneth J. Morton communicated a paper, entitled, "Palæarctic Nemouræ."

Lord Walsingham read a paper, entitled, "A Catalogue of the Pterophoridæ, Tortricidæ, and Tineidæ of the Madeira Islands, with Notes and Descriptions of New Species." In this paper sixty-six species of Lepidoptera belonging to these families were recorded as occurring in the Madeiras, of which thirty were noticed as peculiar to the Islands, twelve as common to the Madeiras and Canaries, of which two were not known as occurring elsewhere, and one extends its range only to North Africa. Over thirty species were added to the list, and one new genus, seven new species, and two new varieties were described. Herr Jacoby and Mr. Bethune-Baker made some remarks on the species and their geographical distribution.

Mr. Blandford read a paper, entitled, "A Supplementary Note on the Scolytidæ of Japan, with a list of Species."

Oct. 17th, 1894.

Henry John Elwes, Esq., F.L.S., F.Z.S., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of a Fellow.

Dr. H. G. Breyer, of Prætoria, Transvaal, South Africa, was elected a Fellow of the Society.

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Exhibitions, etc.

Mr. G. C. Champion read a letter, dated 15th August last, from Mr. J. Y. Johnson, of Funchal, Madeira, on the subject of a recent visitation of Locusts to the Island, and exhibited specimens. Mr. Johnson mentioned that Darwin, in his "Origin of Species," recorded that in November, 1844, dense swarms of locusts visited Madeira. He said that since then, until August last, these insects had not visited the Island. Mr. Champion remarked that the species sent by Mr. Johnson was *Decticus albifrons*, Fabr., not a true migratory locust. Mr. Champion also exhibited specimens of *Anthaxia nitidula*, *Velleius dilatatus* and *Athous rhombeus*, taken in the New Forest during the past summer.

Mr. H. Goss read a letter he had received from Captain Montgomery, J.P., of Mid-Ilovo, Natal, reporting vast flights of locusts there, extending over three miles in length, on the 31st August last, and exhibited a specimen of the locust, a species of *Acridium*. Captain Montgomery stated that, as a rule, his district like most of Natal was free from the pest, but that an exceptional invasion had occurred in 1850.

Mr. J. W. Tutt exhibited four typical specimens of *Emydia cribrum* from the New Forest, and read the following notes:—"These four specimens, as will be seen, are well "spotted and streaked, transversely and longitudinally, with "black. The type is stated by Staudinger in his *Catalog* to "be distributed over 'Central and Northern Europe (except "'the Polar Region); Ural; and, doubtfully, from the moun- "'tains of Andalusia.' Above these are four specimens of the "var. *candida* of Cyrilli. The specimens came from Cour- "mayeur, on the Italian side of Mont Blanc. The species "was taken at a height of some 4,000 feet above sea level, on "rough ground, on the borders of a larch wood. It was "rather readily disturbed during the late afternoon, settling "rapidly again either on the bushes or on dead sticks, with "which the ground was strewn. It was met with again in "the Cogne Valley, from about 6,000 to 8,000 feet, towards "Chevanix. Staudinger describes the variety as 'alis "'anterioribus albis, puncto medio duplo punctisque mar-

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"'ginalibus nonnullis nigris;' and gives as its range 'Italy, "'Southern Germany, Alpine Valleys; Northern Spain, "'Dalmatia, and, doubtfully, Bithynia.' The species is "very variable. Besides the above, Staudinger describes "a var. *punctigera*, Fu., as being 'alis anterioribus punctis "'nigris paucis;' with a range spreading over 'Gaul; "'Southern Germany; and Alpine Valleys.' He also "describes var. *rippertii*, Bdv., as 'alis anticis nigricantibus' "from the 'Pyrenees'; then a var. *inquinata*, Rambur, as "'capite flavescente, alis anticis flavo-albidis, punctis non-"'nullis marginalibus mediisque nigris,' and, lastly, a doubt-"ful var. *chrysocephala*, Hb., from 'Andalusia, Mauritius, "'and, doubtfully, from Southern Russia.' His diagnosis "runs 'capite ochraceo, alis anticis albis punctis marginalibus "'nullis.'"

Mr. R. Adkin exhibited for Mr. H. Murray a specimen of *Erebia æthiops*, in which the left forewing was much bleached, taken in August last, near Carnforth. Mr. Adkin also exhibited a series of *Acronycta rumicis* from Co. Cork, Ireland, including light and black forms, with examples from the Scilly Isles; Isle of Man; and North of Scotland for comparison.

Mr. Elwes exhibited a series of *Chionobas alberta* (male and female), *Chionobas uhleri*, var. *varuna*, and *Erebia discoidalis*, from Calgary, Alberta, N.W. Canada, collected in May last, by Mr. Woolley-Dod. He said that the validity of *C. alberta*, which had been questioned by Mr. W. H. Edwards, was fully established by these specimens.

Professor Poulton gave an account of the changes he had recently made at Oxford in the arrangement of the Hope Collections in the Department of Zoology, and as to the laboratory and rooms now available for students working at these collections.

Paper Read.

Mr. G. T. Bethune-Baker communicated a paper, entitled "Descriptions of the Pyralidæ, Crambidæ, and Phycidæ, collected by the late T. Vernon Wollaston in Madeira."

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November 7th, 1894.

Colonel Charles Swinhoe, M.A., F.L.S., F.Z.S., Vice-President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Fellows.

Mr. W. P. Blackburne-Maze, of Shaw House, Newbury, Berkshire; and Mr. Bertram George Rye, of 212, Upper Richmond Road, Putney, S.W., were elected Fellows of the Society.

Exhibitions, etc.

Colonel Swinhoe exhibited a female of *Papilio telearchus*, Hewitson, which he had received by the last mail from Cherra Punji. He said that this was the only known specimen of the female of this species, with the exception of one in Mr. L. de Nicéville's collection, which he had described in the Journal of the Bombay Natural History Society in 1893. He also exhibited a male of the same species for comparison.

Mr. C. G. Barrett exhibited abnormal forms of *Pararge megæra*, *P. ægeria*, *Melitea athalia*, *Chrysophanus phlœas*, *Charœas graminis*, *Lophopteryx camelina*, *Plusia gamma*, *Cucullia chamomillæ*, *Boarmia repandata*, var. *conversaria*, *Cidaria psittacata*, and other species, all collected by Major J. N. Still on Dartmoor, Devon. He also exhibited for Mr. Sydney Webb, of Dover, a long series of most remarkable varieties of *Arctia caja*, namely, one spotless, cream-coloured and scarlet; one almost spotless, deep brown and black; one almost spotless, deep brown and black on one side only; one with the forewings suffused with pink; one with the forewings spotless dark brown, hindwings brownish-red, spotted; two yellowish, with markings suffused with brown; one with all the usual markings delicately pale yet distinct; and others variously suffused on fore or hindwings with dark colouring. He also exhibited for Mr. Sydney Webb the following varieties of *Arctia villica*, viz., one wholly cream-coloured except the edges of the front wings, which

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were black; two with the cream-coloured spots united in varying degrees; two with the hindwings much suffused with black; two with wings differently spotted on the opposite sides; and one with the hindwings nearly spotless but bordered with black.

Mr. Gervase F. Matthew exhibited seven beautiful and striking varieties of *Arctia villica*, bred from larvæ obtained on the Essex coast, near Dovercourt, in March and April, 1893 and 1894.

Herr Jacoby exhibited two specimens of *Bleps mucronata*, with elytra which had not hardened although exposed to the air for a long time, taken on a wall at Hampstead. The Rev. Canon Fowler and Mr. G. C. Champion made some remarks on the subject of the elytra of immature beetles.

Mr. H. Goss exhibited a specimen of *Periplaneta australasiæ*, received from Mr. C. E. Morris, of Preston, near Brighton. Mr. McLachlan said the species had been introduced into this country, but was now considered a British insect.

Mr. B. G. Rye exhibited specimens of the following rare or local species of Coleoptera:—*Cicindela germanica*, from Swanage; *Eumicrus rufus*, from Shirley; *Triarthron markeli*, from Lewisham; *Mezium affine*, from Shoe Lane, E.C.; *Homaloplia ruricola* and *Anomala frischi*, var. *julii*, from Swanage; *Synaptus filiformis*, from Sunbury; *Lixus paraplecticus*, from Wicken Fen; *Balaninus cerasorum*, from Wimbledon; *Asemum striatum*, from the New Forest; and *Zeugophora flavicollis*, from Wimbledon.

Mr. McLachlan exhibited for Mr. G. C. Bignell, of Plymouth, two new species of Ichneumonidæ, from Devonshire, viz., *Pimpla bridgmani*, Bign., a parasite on a spider, *Drassus lapidicolens*, Walck., and *Praon absinthii*, Bign., a parasite on *Siphonophora absinthii*, Linné; together with *Pimpla epeiræ*, Bign., also a parasite on a spider.

Mr. C. O. Waterhouse stated that the Acridium received by Mr. Goss from Capt. Montgomery, and exhibited at the last Meeting, was *Acridium septemfasciatum*, and he exhibited the species with the wings extended.

Mr. Ridley exhibited a species of a scale insect (? *Lecanium*)

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found on a nutmeg tree in Malacca, and made some remarks on *Formica smaragdina*, which makes its nest on the trees, joining the leaves together by a thin thread of silk at the ends. He stated that the first step in making the nest is for several ants to bend the leaves together and hold on with their hind legs, and one of their number after some time runs up with a larva and irritating it with its antennæ makes it produce a thread with which the leaves are joined; when one larva is exhausted a second is fetched, and the process is repeated.

Paper read.

Mr. Waterhouse read the following paper entitled, "Some "remarks on the Antennæ of Insects."

"I have lately been preparing a series of antennæ for "exhibition in our Museum. There were one or two points "upon which I wanted information, but which I failed to "find recorded in a satisfactory manner; and there are one "or two points, which, although touched upon by Herr "Kolbe in his excellent work, 'Einführung in die Kenntnis "'der Insekten,' have not had sufficient prominence given to "them. I venture to call attention to these this evening.

"In the first place, I wanted to know the extreme limits in "the number of joints in the antennæ. I found these varied "from two in *Platyrrhopalus* and some other species of "Coleoptera, to 480 in *Meroncidius*, one of the long-horned "Locusts. *Articerus*, one of the *Pselaphidæ*, is said to have "an antenna consisting of a single joint, but my examination "did not satisfy me that this was really the case. Possibly "some Locusts may have even a greater number than the "species I counted. In the *Lepidoptera* I found the number "of joints varied from 17 in *Oncopera*, one of the *Hepialidæ*, "to 120 in *Thysania*, a large Mexican Noctuid.

"The next point I would call attention to is the club of "the antenna. In certain groups the antennæ always "terminate in a club; but it is curious to note certain "species appearing with a clubbed antenna, when all their "allies have simple antennæ. In the Longicorn Coleoptera, "for example, there are some 10,000 species, all with more "or less linear or acuminate antennæ, but *Telocera*, an

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"Australian insect, has a distinct club. In the Aculeate "Hymenoptera again the antennæ are almost always of a "simple character, and more or less acuminate, but *Nomia* "*antennata* has a distinct club, as has also *Steganomus*, and "in another genus, *Thaumatosoma*, a different form of club is "met with. The bi-pectinate antenna of *Psammotherma*, one "of the *Mutillidæ*, is another case of a form of antenna "presenting nothing special in itself, but remarkable as "standing alone among the *Aculeata*.

"In the Diptera we see filiform antennæ, consisting of a "series of cylindrical or bead-like joints (e.g., *Tipula*, "*Cecidomyia*), and others of the disk and arista type, the "intermediate forms being seen in *Xylophagus*, *Oxycera*, "*Chloromyia*, and *Sargus*.

"The antennæ of this latter type are generally very small "and inconspicuous. In certain *Dolicopidæ*, however, the "arista is sometimes very long, and here, again, we meet "with a club where it might be least expected; I would "particularly mention a *Psilopus* from Ceylon, a pretty "green fly five millimetres long, having antennæ six milli-"metres in length, terminating in a flat club.

"The clubbed antenna appears among the Neuroptera in "the *Myrmeleonidæ* and *Ascalaphidæ*, being most pronounced "in the latter.

"In the Orthoptera a club is very rare, but is seen in "*Gomphocerus*. In the Hemiptera a few species have a "slight club, as in *Verlusia*.

"I will now just mention another point. In the antenna of "the little water-beetle, *Parnus*, the antennæ are very short, "and the second joint is much enlarged and produced forwards. "It is curious to notice a very similar development in *Gyrinus*, "a water-beetle belonging to a totally different family. And "in the great water-bug, *Belostoma*, the second joint is also "produced forwards, but in this case the third joint is simi-"larly formed, and the fourth has a small hook also turned for-"wards. It is difficult to suggest a satisfactory reason for this."

Mr. Champion, Herr Jacoby, Mr. McLachlan, and Mr. Gahan took part in the discussion which ensued.

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December 5th, 1894.

Henry John Elwes, Esq., F.L.S., F.Z.S., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Fellows.

Mr. E. Augustus Bowles, M.A., of Myddelton House, Waltham Cross, Herts; Mr. E. C. Cotes, of the Indian Museum, Calcutta; Mr. Joseph W. Green, of West Lodge, Blackheath, S.E.; Mr. Henry Keeble, of 10, Coleman Street, E.C.; Mr. Thomas Turner, of Cullompton, Devon, and Mr. F. H. Wolley-Dod, of Calgary, Alberta, Canada, were elected Fellows of the Society.

Exhibitions, etc.

The Secretary read a letter from Mr. McLachlan, the Treasurer, on the subject of the Committee,* which had been appointed, consisting of the Treasurer, the Honourable Walter Rothschild, and Mr. Hampson, for the purpose of settling the date of publication of Part I. of the Transactions of 1894. Mr. McLachlan reported that the Committee had ascertained that the Part was first obtainable from the publisher's on May the 11th, 1894, and that this was therefore the date of publication.

Mr. F. Merrifield exhibited hybrids belonging to the genus *Saturnia*, obtained by Dr. Standfuss, of Zürich; viz. a male and female hybrid from a male of *Saturnia pavonia* and a female of *Saturnia pyri*, to which he had given the name of *Saturnia emiliæ*; also hybrids from what Dr. Standfuss described as "a male of *Callimorpha dominula* var. *persona*" (received from Tuscany) and a typical female of *Callimorpha dominula*, to which he had given the name of *romanovi*. Mr. Merrifield remarked that the so-called var. *persona* differed entirely from the type of *Callimorpha dominula*.

* See Proc. of Meeting on June 6th, 1894, p. xxiii, *ante*.—H. G.

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Mr. J. W. Tutt exhibited specimens of a very small form of *Euchloë*, and read the following notes:

"As the Fellows of this Society well know, the Rev. F. B. "Newnham, of Church Stretton, Salop, has sought during "the year in the pages of 'The Entomologist's Record, etc.,' "to establish two species of *Euchloë*, distinguishing from "*E. cardamines*, a form 'much smaller than *E. cardamines*, "'measuring, on an average, only about an inch and a quarter "'from tip to tip of the forewings; the discoidal spot being "'placed, as in *E. turritis* and *E. gruneri*, at the juncture of "'the orange and white spaces, not, as in *E. cardamines*, well "'within the orange tip. When viewed under the microscope, "'the wing-scales appear very different from those of *E.* "'*cardamines*.' He then proposed for this supposed new "species the name of *E. hesperidis*. Mr. Newnham sent me "an example of *E. hesperidis* and asked me whether I would "'exhibit it at one of the Societies' meetings where there "'are some Entomologists acquainted with Continental "'insects.' I have, therefore, brought the specimen for "exhibition to-night.

"With regard to this, I may say that Staudinger describes "an Italian form as 'ab. (et var. ?) *turritis*, Och., iv., p. 156, "'ab. minor, alis anterioribus puncto, nigro part. albam "'attingente.' Mr. Newnham, owing, it would appear, to "an error made (and corrected 'Ent. Rec.,' v., p. 146) by "Mr. Kirby, considered *turritis* distinct; I do not know that "there is any evidence tending to prove that it is anything "but a small form of *cardamines*.

"There has been, of course, considerable discussion as to "these small specimens of *Euchloë*, but until the supposed "species is bred and some really good characters obtained "from the earlier stages, it appears totally impossible to "accept it as a species on such slender characters as the "imago affords. *E. cardamines* of normal size varies end-"lessly in the position of the discoidal spot with regard to the "orange blotch (*vide*, 'Ent. Rec.,' etc., vol. v., pp. 173, 174), "where I have given a somewhat long table. The difference "in scaling, if only comparative, is to be expected in small "specimens, for it is well-known now that most small

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"aberrations owe their diminutive stature to a deficiency of "food, and this would show as strongly in the scales as in "other structures. Reference to these small specimens are "scattered through many Entomological Magazines, and "these records extend over many years. We find such in 'The "Northumberland and Durham Catalogue,' by Mr. Wailes; "in Newman's 'British Butterflies;' in the 'E. M. M.,' "vol. xxv., by Mr. C. G. Barrett, etc. Mr. T. D. A. Cockerell "('Entom.,' vol. xxii., p. 176) calls this small form *Euchloë* "*cardamines* var. *minor*, a name I presume that will have to "sink in favour of *turritis*, Och.

"Personally, however, I am quite open to conviction and "shall be pleased to agree with Mr. Newnham as soon as I "am satisfied as to its specific distinctness, even by one "single indubitable character.

"To exemplify the difference in size which *cardamines* "reaches, even in the same locality, I exhibit three specimens "captured in Chattenden. The large female (al. exp. 2·0625 "inches) was taken there, May 22nd, 1888. The small "female (al. exp. 1·25 inches) and the male (al. exp. 1·813 "inches) were both taken on May 28th, 1892. The speci- "men of *hesperidis* is rather larger than my small female, "being 1·813 inches."

Mr. Tutt also exhibited specimens of *Noctua dahlii*, and read the following notes:

"The study of the variation of our NOCTUÆ is certainly one "of the most interesting pursuits of British Entomologists. "The specimens exhibited to-night are those of *Noctua dahlii*, "a species which shows not only a considerable range of "sexual dimorphism, but also of variation according to "geographical distribution. Of those exhibited twenty "specimens were captured in Delamere Forest by Mr. Geo. "Day of Knutsford. These specimens, as will be observed, "show the usual sexual dimorphism which is so conspicuous "in Great Britain. This dimorphism is well marked in the "specimens which I have from Aberdeenshire, Yorkshire, "Essex, and other localities, the males being of a bright "chestnut colour, the females being of a purplish colour "with a wide range extending from red with a purple tinge

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"to purplish black. The males, it will be observed, have a "strong tendency to develop a dark central transverse band "or a dark subterminal band, but very rarely are both "present in the same specimens. The distinct sexual "dimorphism here exhibited, however, does not occur "throughout the British Isles. At Morpeth the males con- "sist of a mixture of the ordinary chestnut form, together "with purple forms, the latter being coloured like the females "which show the usual purple-red range of variation. If, "therefore, in this species the purple be considered the older "form, it is clear that at Morpeth the evolution of the sexual "colour difference has not yet reached so complete a stage as "in many other localities. I exhibit Morpeth specimens show- "ing the two male forms and usual female form found there.

"In Aberdeenshire, where the species is usually abundant, "the sexual dimorphism is again very marked, the females "varying, as usual, very much in the intensity and depth of "colour. I have, however, out of some 200 specimens examined from Aberdeenshire, only seen one male of a "purplish-red tint. This specimen, which I exhibit, has a "remarkably pale subterminal band to the anterior wings. I "also exhibit two remarkable male aberrations from Aber- "deen, one with a clear central band with scarcely a trace of "discoidal spots between a dark basal and a dark subter- "minal band; the other deeply suffused with purplish- "fuscous. There is also among the Delamere Forest speci- "mens a female with the basal area chestnut coloured, the "outer part being very dark purplish.

"Four Aberdeenshire females exhibited are the darkest I "have ever seen, and have been selected from a very large "number of specimens. One of the Delamere Forest speci- "mens is similar. They are, as will be seen, of a fuscous- "black coloration with the normal purple almost obsolete. "These dark specimens have, as a rule, very indistinct stig- "mata and transverse markings.

"Perhaps the most peculiar fact about this species, how- "ever, is, that in Ireland, so far as I know, the males and "females show none of the sexual dimorphism so distinct "and prevalent in Great Britain, but both sexes are of the

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"normal purple-red coloration of the female. The common "mottled chestnut male either does not occur or exists as a "very rare aberration in Ireland, just as in Great Britain "purple-red males only occur as a rare aberration. It is this "isolation of the purple form in both sexes in Ireland, "together with the fact that this form approaches more "nearly to its nearest generic congeners—*stigmatica*, *brunnea*, "and *ditrapezium*—in colour which makes me inclined to "look upon this as the older form, and the bright chestnut "males as more recently evolved.

"As I have already noted, there is a tendency in this "species to show a considerable range in minor aberrational "forms. The redder females are the ab. *rufa* of 'The "'British Noctuæ,' etc., which is distributed rather commonly "among the males and females of the Irish and the females "of the English and Scotch specimens. The ab. *fusca* has "a large quantity of fuscous mixed with the purple colour, "becoming in many specimens almost black, whilst the ab. "*candelisequa* of Stephens is a glaucous tinged form of *dahlii*, "rare enough in this species, although glaucous tinted speci- "mens are quite a feature in the colour aberrations of this "genus, becoming quite common in *N. festiva*, and almost "the rule in *N. sobrina*. A very pale reddish form of this "species was recently exhibited, by Mr. A. F. Bayne, at the "City of London Entomological Society, and although those "of us who know the extent of variation that *N. festiva* "undergoes in Scotland, will scarcely agree with Guenée that "'the species varies no less than *festiva*,' our recent know- "ledge has convinced British lepidopterists that *dahlii* is an "exceedingly variable species.

"The triple colour variation of the female *dahlii* is very "interesting—red, purple, and black being the extent of "variation through which *stigmatica*, *brunnea*, and *c-nigrum* "extend, whilst in *brunnea* ochreous mottling in the males is "far from uncommon. This parallel range of colour varia- "tion in closely allied species is proving very general "wherever sufficient material, collected over a sufficiently "wide area, has been obtained."

Herr Jacoby read a letter received from Mr. Buxton

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Forman, one of the Assistant Secretaries of the Post Office, to the effect that the Postal Union had decided to make a rule not to admit natural history specimens by sample post, which was intended for the transmission of bonâ fide trade patterns or samples of merchandise, and consequently that the forwarding of such specimens at the sample rate would in future be irregular.

Lord Walsingham stated that he had had a long correspondence with the Post Office authorities on the subject, and that the late Mr. Raikes, when Postmaster-General, promised him in 1891 that such specimens should, so far as the British Post Office was concerned, be transmitted at the sample rates; and a letter to the same effect, from the late Sir Arthur Blackwood, when Secretary to the Post Office, was published in the Proceedings of the Society for 1891.

Mr. C. G. Barrett exhibited for Mr. A. J. Hodges a specimen of *Hydrilla palustris*, from Wicken Fen; also specimens of *Caradrina ambigua*, from the Isle of Wight. He remarked that of the latter one specimen had the hind margin of right forewing indented, and the wing broadened as though from an injury to the pupa. In this wing the margins of the large orbicular and reniform stigmata had become so joined that the dividing lines had disappeared, and the stigmata were fused into one irregularly formed blotch. The left wing of the specimen is normal. The effect of the injury seems to have been as though the two stigmata had been in a semi-fluid condition and had run together.

Mr. McLachlan exhibited, on behalf of Mr. G. F. Wilson, F.R.S., of Weybridge, a "grease band" which had been tied round trees to prevent the females of *Cheimatobia brumata* from ascending the trunks for the purposes of oviposition; the band was thickly covered with the bodies of the females, together with a few males.

Surgeon-Captain Manders exhibited a pair of *Chelura bifasciata*, from the Shan States, and called attention to the "assembling" habits of the male, some hundreds of which were attracted by the numerous females which emerged from the cocoons at sunset.

Mr. B. A. Bower exhibited a beautiful variety of *Zygæna*

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loniceræ, Esp., having the spots confluent, taken at Chattenden Wood, North Kent, in June last; also a specimen of *Incurvaria tenuicornis*, Stn., taken at Chislehurst, in May, 1893.

Mr. H. Goss exhibited, for Mr. F. W. Urich, of Trinidad, a series of males, females, and workers of *Sericomyrmex opacus*, Mayr, a species of Fungus-growing and Fungus-eating Ant. He said he was indebted to Mr. G. A. J. Rothney for kindly mounting the specimens on card.

Papers Read.

Colonel Swinhoe read a paper entitled "A List of the *Lepidoptera* of the Khasia Hills, Part III."

Mr. C. J. Gahan read a paper entitled "On the Longicorn *Coleoptera* of the West India Islands."

Mr. F. W. Urich communicated a paper entitled "Notes on the Fungus Growing and Eating Habit of *Sericomyrmex opacus*, Mayr."

Prof. E. B. Poulton read the following paper, by Prof. E. B. Titchener, of Cornell University, U.S.A., entitled "An apparent case of Sexual Preference in a Male Insect."

"I have had under observation during the past summer a "number of *Diapheromera femorata*. The insects were all "taken from a single clump of *Rubus odoratus*, and have been "fed upon the leaves of this shrub. Seven were taken in the "second week in July, five females and two males. All but "one backward female were in the same stage of develop-"ment, having two skin-castings to come before maturity "was reached. One of the females had lost her two front "legs, and there was no renewal of these with either of the "new skins. The first male to become sexually mature was "small and weak; though he has proved to be exceptionally "long-lived. He 'chose' the maimed female, from the group "of four. Two days later the other male, which had left "the other females untouched, was found in connection with "this same one, having driven his weaker rival away. The "remaining females, with the exception of the immature one, "were fertilised subsequently. In the last week of August I

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"took two more insects, a mature male and female, separ-
"ately. Although the cage was quite large, there was a good
"deal of scrambling and fighting among the males when the
"newcomers were introduced. The new male, with five
"females to choose from, all already fertilised, settled upon
"the maimed female. A few days later, I found two insects
"in connection. They were placed in the cage with the rest
"in this condition. Next morning I saw that the fresh male
"had left its female, and was in connection with the maimed
"one.

"Four males in succession, therefore, had 'preferred' this
"mate, out of a possible four, five, or six. Moreover, she
"was constantly in connection with one of them, while the
"rest were often left unsought for some days together. I
"thought at one time that the reason of these phenomena
"might lie in a purely mechanical fact: the female in
"question, being maimed, could not move so quickly as the
"rest, and so could not escape the advances of the male.
"But I only once saw a male shaken off by a female—the
"first male mentioned above: and that female was a virgin.
"When once fertilisation by one male had taken place, the
"female remained passive at the approach of others. When
"the third and fourth males were introduced, all the avail-
"able females had had connection. The experiment is not,
"of course, 'pure;' no experiment made in captivity is.
"Still, the insects took to their confinement very well; feeding
"heartily and breeding readily. I record the facts for what
"they were worth, and shall be glad to answer any question
"as to possible sources of error that may occur to the readers
"of them. Another watcher beside myself has had the
"insects under pretty constant observation, and can confirm
"the above account."

The President and Prof. Poulton made some remarks on the observations recorded in Prof. Titchener's paper.

The Rev. H. S. Gorham communicated a paper entitled "Notes on Herr A. Kuwert's * Revision der Cleridengattung "*Omadius*, Lap."

* Annales de la Société entomologique de Belgique. Tome Trente-huitième, iii., pp. 62–97, 1894.

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"Herr A. Kuwert in giving analytical tables and descrip-
"tions of 44 species, presumed to be new, of this most
"difficult genus, labours under the disadvantage of not
"having consulted the records of previous workers in the
"family of the Cleridæ.

"Had he done so he could hardly have failed to discover
"that I published in 1876 (Cistula Entomologica, p. 57),
"'Notes on the Coleopterous family Cleridæ,' with critical
"remarks, at pages 92 and 101, on this genus and on *Stig-*
"*matium*, with descriptions of eleven new species of *Omadius*,
"and many of *Stigmatium*, and with some synonymy founded
"on the examination of typical specimens from the collec-
"tions of Guérin Meneville, Chevrolat, W. W. Saunders,
"Wallace, Semper, and others mentioned at p. 58 of the
"work mentioned.

"These will all be found recapitulated in the 'Zoological
"Record,' for 1876, at pp. 60—62.

"If Herr Kuwert had done thus, and had he, also, looked
"up his references, he would not have fallen into the error
"of referring the type of the genus *O. indicus* to Spinola, and
"of substituting for that name *prolixus*, Klug, whereas it
"(*O. indicus*) is referable to Laporte, and was published in
"Silberman's Revue (1833—39). Nor would he refer
"'Chevrolat's species to Guérin,' they having been expressly
"published in M. A. Chevrolat's name.

"One species of mine, *O. notatus*, has apparently somehow
"come under Herr Kuwert's notice. It is briefly placed as a
"synonym of *kamelianus*, White, thus (? *notatus*, Gerb.) sic.
"Beyond the fact that both are described as from the Philip-
"pine Islands, no reason is given for thus conjoining
"them.

"Some names such as *Cramensis* for an insect for *Ceram*,
"which is corrected in the description, may be overlooked as
"misprints, and it is a little remarkable that Herr Kuwert
"has escaped colliding with any of my names, either in
"this genus or in *Stigmatium*; although '*angustifrons*,' No. 26,
"is very suggestive of some relation with '*angusticeps*,' Gorh.,
"one being from Sumatra, the other from Borneo.

"*O. nigropunctatus*, Chevr., has been, by comparison of

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"types and otherwise, identified by me with *O. medio-*
"*fasciatus*, Westwd., and is so beyond all doubt, being a very
"easily identified species.

"The redescription of a species from Perak as *O. javanus* is
"very futile, that name having been used by Dejean and
"placed as a synonym of *O. indicus* in Gemm. and Harold
"Catalogue, teste Spinola.

"The finest and most conspicuous species, *O. prioceroides*,
"Thoms., escapes notice altogether.

"Synthesis, we may remind Herr A. Kuwert, is an impor-
"tant part, nay, essential to revision.

"*Revision des genus* STIGMATIUM.

"Under this title, in the 'Annales de la Société Ento-
"mologique de Belgique,' Tome xxxviii., Pt. viii., pp. 398—
"457, Herr A. Kuwert has published an analytical and
"descriptive paper of such species of the genus *Stigmatium*,
"Gray, as were known to him. These are, apparently, con-
"tained: (1) in his own collection; (2) in that of the Honble.
"Walter de Rothschild, Tring Park (England); (3) in the
"Museum at Berlin; (4) in the Museum at Vienna. Of
"however, the majority of species, either newly described or
"identified with described species, no clue is given as to how
"they have been identified, or by whom collected. Herr
"Kuwert has made no attempt to identify the many species
"of this genus described by M. A. Chevrolat and myself
"during the past eighteen years, although we have been well
"known to have paid special attention to the family Cleridæ.
"In 1876, Chevrolat published a very considerable contri-
"bution to the knowledge of this group, entitled 'Mémoire
"sur la famille des Clerites,' in this paper ten species of
"*Stigmatium* from the collections of Boucard, Haag de Ruten-
"berg, Sahlberg, Sallé, etc., are described. In the same
"year, after communication with M. Chevrolat, I described in
"'Cistula Ent.,' no less than 22 species with one new allied
"genus, '*Hemitrachys*.' Since then I have printed many
"papers on Cleridæ, in which reference to these species and
"some additions appear. The species thus described formed
"part of the world-known collections of Bates and Wallace;

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"and most of the important collections, both of this country "and of France, Holland, Belgium, and Italy, have passed "through my hands, and many of the types are in my own "collection. Herr Kuwert, however, passes the whole of "this over in silence. I may add that several of his species "appear at first sight to be identical with my own.

"The species of this genus are more difficult and obscure "than perhaps any other genus of the family, perhaps as "much so as those of any genus of *Coleoptera*.

"The student now will find himself in a hopeless con- "fusion, from which nothing but the collation and close "examination of the types of my own, and the scattered "types of Herr Kuwert's descriptions can extricate him.

"The types, however, of all my species are in my posses- "sion, and are, of course, accessible to any one coming here to "see them."

ANNUAL MEETING.

January 16th, 1895.

Henry John Elwes, Esq., F.L.S., President, in the chair.

Mr. W. F. H. Blandford, one of the Auditors, read the Treasurer's Balance Sheet, showing a balance in the Society's favour of £29 2s. 7d.

Mr. H. Goss, one of the Secretaries, read the following :—

Report of the Council.

During the Session 1894–95, one Honorary Fellow, Pastor Wallengren, and four ordinary Fellows have died, *viz.*, Major-Gen. George Carden, the Rev. Alfred Forbes Sealy, Mr. John Jenner Weir, F.L.S., and Dr. F. Buchanan White, M.D., F.L.S.; eight Fellows have resigned; three have been restored to the list; and twenty-six new Fellows have been elected.

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The number of Fellows elected during the year is slightly above the average. At the same time it is desirable to increase our numbers more rapidly, so as to enable us to publish more papers, and allow more plates, and in other ways to advance our interests and promote our objects. The Council, therefore, again appeal to the Fellows to do their utmost to induce their friends to join the Society and thus increase its revenue.

At the present time the Society consists of 9 Honorary, 49 Life, and 324 Fellows paying the Annual Subscription, making the total number of Fellows now on our List 382, which, after allowing for the losses by deaths and resignations, is an increase of 16 since the Annual Meeting last year.

Our Transactions for the year 1894 form a volume of 586 pages, containing 25 Memoirs contributed by the following authors, *viz.*, Mr. Edward Meyrick, B.A. (2 papers); Mr. Charles Owen Waterhouse; Mr. George T. Bethune-Baker (2 papers); Mr. Walter F. H. Blandford, M.A. (2 papers); Mr. Hamilton H. Druce; Colonel Charles Swinhoe, M.A.; Mr. George C. Champion (2 papers); Mr. Edward Saunders; Dr. Frederick A. Dixey, M.A., M.D. (2 papers); Dr. Thomas A. Chapman, M.D.; Mr. Charles B. Taylor; Mr. William F. Kirby; the Rev. Canon Fowler, M.A.; Mr. Frederic Merrifield; Mons. Louis Péringuey; Mr. Charles J. Gahan, M.A.; Professor Franz Klapálek; the Rev. Thomas A. Marshall, M.A.; the Right Hon. Lord Walsingham, LL.D., F.R.S.; and Mr. Kenneth J. Morton. Of these 25 papers 12 relate to Lepidoptera (or to enquiries in which they were the subjects of experiment), 7 to Coleoptera, 2 to Hemiptera, 2 to Neuroptera, 1 to Hymenoptera, and 1 to an entomological excursion to Corsica. The Memoirs above referred to are illustrated by 14 plates, of which 5 are coloured. The Society is indebted to Mr. G. T. Bethune-Baker for half the cost of Plate I., to Colonel Swinhoe for part of the cost of Plate II., and to Mr. F. Merrifield for the entire cost of Plate IX.

The Proceedings, containing an account of the Exhibitions and Discussions at the Meetings, in addition to several papers not published in the Transactions, and to several Notes of

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interest in connection with Exhibitions, extend to 48 pages.

During the past year about 250 Books, Pamphlets, Journals, and Papers have been added to the Library; and the Meetings have been better attended than in any previous year.

Another matter for congratulation is the increased use made of the Library by the Fellows of the Society, which is shown by the following figures, furnished me by our Resident Librarian, Mr. W. R. Hall. In 1889 the number of books borrowed or referred to was 95. In 1890 this number was raised to 108, and in 1891 to 170. During the past year the number has been increased to 209! The figures speak for themselves, and show that the value and advantages of the Library are fully appreciated.

The Balance Sheet which you have just heard read, and which is appended to this Report, includes, under the head of Donations, one of £45 from our generous benefactor Mr. J. W. Dunning, on the anniversary of the 45th year of his election as a Member, with a suggestion that it might be applied partly to general purposes and partly to additions to the Library, which suggestion has been acted upon.

The Subscriptions received for the year 1894 amount to £309 15s., a sum in excess of that for any former year.

Subscriptions in arrear were paid up to an extent exceeding expectations; but, on the other hand, the amount still due for 1894 is much in excess of that which is usual at the end of a year.

The sales of our Transactions have been satisfactory, and show a notable increase on those of the years immediately preceding.

In February last the Misses Swann, nieces of our lamented Honorary Life President (the late Professor Westwood), handed over the "Westwood Bequest" of £250, and it has been invested in the names of Trustees in Birmingham Corporation 3 per cent. Stock.

Three Life Compositions have been received during the year, and invested in Consols. The total sum now so invested being £455 18s., representing £473 11s. stock.

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Commencing the year with a balance in hand of £10 6s. 1d., this was increased to £29 2s. 7d. on the 31st December, with no outstanding liabilities; and after carrying forward £7 7s. for subscriptions received in advance to the credit of 1895, a result that cannot be considered other than satisfactory.

11, Chandos Street, Cavendish Square, W.
January 16th, 1895.

The Secretaries not having received any notices of objection, the following Fellows of the Society were declared duly elected members of the Council for the Session 1895–1896 :—Mr. George T. Bethune-Baker, F.L.S.; Mr. Walter F. H. Blandford, M.A., F.Z.S.; Mr. George C. Champion, F.Z.S.; Dr. Frederick A. Dixey, M.A.; Mr. Henry John Elwes, F.L.S.; Canon Fowler, M.A., F.L.S.; Mr. Charles J. Gahan, M.A.; Mr. Herbert Goss, F.L.S.; Mr. Robert McLachlan, F.R.S.; Professor Raphael Meldola, F.R.S.; Professor Edward B. Poulton, M.A., F.R.S.; Dr. David Sharp, M.A., F.R.S.; and the Rt. Hon. Lord Walsingham, M.A., LL.D., F.R.S.

The following were the Officers elected :—*President*, Professor Raphael Meldola; *Treasurer*, Mr. Robert McLachlan; *Secretaries*, Mr. Herbert Goss and the Rev. Canon Fowler; *Librarian*, Mr. George C. Champion.

Mr. Elwes then read his Address, at the conclusion of which Professor Meldola moved a vote of thanks to Mr. Elwes for his Address, and for his services as President during the past year, and he also moved a vote of thanks to the Treasurer, Secretaries, and Librarian for their services during the past year. This was seconded by Mr. F. Du Cane Godman, and carried unanimously. Mr. Elwes, Mr. McLachlan, Mr. Goss, and Canon Fowler made some remarks in acknowledgment.

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ENTOMOLOGIAL SOCIETY OF LONDON.

Balance Sheet for the Year 1894.

Receipts.	£	s.	d.
Balance in hand, Jan. 1st, 1894	10	6	1
Subscriptions for 1894	309	15	0
Arrears	18	18	0
Admission Fees	48	6	0
Donations	57	4	6
Westwood Bequest	250	0	0
Sale of Transactions, &c.	77	5	6
Interest on Investments :—			
Consols £11 8 2			
Westwood Bequest 3 9 6			
	14	17	8
Life-Compositions	47	5	0
Subscriptions in advance	7	7	0
	£841	4	9

Payments.	£	s.	d.
Printing Transactions, &c.	216	13	6
Plates, &c.	69	16	0
Rent and Office Expenses	183	13	2
Books and Binding	37	7	6
Investments :—			
Consols £47 5 0			
Westwood Bequest 250 0 0			
	297	5	0
Subscriptions in advance carried to 1895	7	7	0
Balance	29	2	7
	£841	4	9

ASSETS.

Subscriptions in arrear (considered good) £16 16*s.* 0*d.*

Investments :—

Cost of £473 11*s.* 0*d.* Consols = £455 18*s.* 0*d.*

Cost of £239 12*s.* 4*d.* Birmingham Corporation 3 per cent. Stock (Westwood Bequest) £250.

LIABILITIES.

(Nil.)

Robert McLachlan,

Treasurer.

Examined and found correct,

Samuel Stevens.
A. Hugh Jones.
Walter F. H. Blandford.
Charles J. Gahan.
Osbert Salvin.

9th January, 1895.

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ADDRESS,

ETC., ETC.

GENTLEMEN,

The time has now arrived when, in accordance with the rules of this Society, I have to resign the Presidency into other hands, and I do so with less regret, because, as I said in my address last year, I find that the numerous duties and pleasures of life, and the greatly increased amount of business which my connection with agriculture at present entails, leave me too little time to attend to the work of the Society; and because I know that I am resigning it into the hands of a gentleman who will, as a Fellow of the Royal Society, resident in London, be able to do much more to advance the interests of the Society than I can do.

I am happy to think that, as I leave the chair, the Society is more numerous, more active, and richer than when I took it, and hope that it will continue to make as satisfactory progress in numbers and ability as it has done for some years past.*

No event of great importance has, so far as I know, taken place in the entomological world during the past year. The number of memoirs and papers registered by the indefatigable labours of our colleague, Dr. Sharp, in the Zoological Record, is no less than 1069 against 1026 in the previous year, and I fear that the difficulty of keeping pace with, and studying this enormous mass of material, to which I made

* The increase in the number of Fellows is from 254 in 18[illegible]

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special allusion in my address last year, continues to increase.

We have not lost by death during 1894 either so many or such distinguished men as those whose names I had to mention last year. Of our Fellows, the oldest and best known is John Jenner Weir, F.L.S., etc., who died at Beckenham in August. He had been a Fellow since 1845, and was a most regular attendant at our meetings during nearly fifty years. He was often a Member of Council, Treasurer from 1876 to 1879, and vice-President in 1886. Though not a prolific writer, he had a large general acquaintance with British and Exotic Lepidoptera, as well as a good knowledge of ornithology and botany. Of late years he had formed a fair general collection of butterflies, which was dispersed at Stevens' rooms soon after his death. He was a most amiable and popular man, who will be much missed at our meetings.

Major-General George Carden, F.E.S., died at Bromley on Feb. 12, aged 56, from the effects of influenza. He had served with the 77th regiment in the Crimean War, and with the Northumberland Fusiliers during the Indian Mutiny, and commanded this regiment for some years. Though not a scientific entomologist, he was a close observer, and an active collector of British Lepidoptera.

Francis Buchanan White, M.D., died at Perth, on Dec. 3rd, aged 52, having been a Fellow of our Society since 1868. He devoted a great part of his life to the study of natural history, especially in the Highlands of Scotland; and though perhaps more a botanist than an entomologist, had contributed many papers on his discoveries to the 'Entomologist's Monthly Magazine' and other periodicals. Perhaps his best known and most important works were his paper 'On the Male Genital Armature in the European Rhopalocera,' published in the 'Transactions of the Linnean Society,' and a memoir on the Pelagic Hemiptera of the Challenger Expedition. He was for some years President of the Perthshire Society of Natural Science, and editor of its Proceedings, and, though not so well known in England, was a leading man among Scottish naturalists.

Dr. Hearder of Carmarthen, and William Machin of

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London, were also known as at one time collectors of British Lepidoptera, but I am not aware that either has written anything of permanent interest.

Among foreign entomologists who have died in 1894, I find but very few names of note. The most eminent perhaps were Lucien Francois Lethierry, who died at Lille on April 4th, aged 64. Together with Dr. A. Puton, he probably held the first place among Hemipterists, and had commenced to publish a general Catalogue of the Hemiptera of the world, of which the first part appeared in 1893. He had been a member of the Entomological Society of France since 1857.

Dr. Jacob Spångberg was a well-known Swedish entomologist, who had written on Hemiptera, and published a monograph of the Scandinavian *Psocidæ*, and some papers on Lepidoptera as well. He was a leading member of the Swedish Entomological Society.

Hugo Theodor Christoph died at St. Petersburg on Oct. 24, aged 63. He was one of the most energetic collectors of insects in Europe, and had travelled extensively for many years in various parts of the Russian Empire, especially in Amurland, North Persia, Transcaspia, and the Caucasus. A Saxon by birth, he went to Sarepta as a teacher in 1858, and at once began to make his name well known among European lepidopterists. Of late years he had been employed by the Grand Duke Nikolas Mikhailovitch as curator of his collections, and had resided at St. Petersburg, except during the summer months, which he usually spent in the Caucasus. He had written numerous papers on the results of his expeditions, and described many new species of Lepidoptera. He will be a great loss to science, as there was probably no one better acquainted with the Lepidoptera of the Russian Empire.

The subject which I have chosen for my address is one in which for many years I have taken great interest, namely, the Geographical Distribution of Butterflies; for though a great deal has been written of late years on the distribution of plants, mammals, birds, fishes, and reptiles, comparatively little has yet been done, so far as I know, by entomologists to show how far the natural divisions

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of the earth's surface which have been established for other classes are applicable to insects. I think that the proportion of known as compared with unknown insects is still too small, and the classification of the known species still too uncertain, to allow the same methods to be applied to them that have been used for mammals by Wallace, for birds by Sclater and Sharpe, and for plants by Hooker, Dyer, and Hemsley; but still I think we might do more than we have done in this branch of our subject.

Personally, I believe that it is still too soon to investigate, with much hope of success, the reasons for a thousand curious and apparently inexplicable facts which turn up in the study of distribution, and of which, I think, the specimens I am showing to-night, in illustration of these remarks, afford abundant proof; but I hope to draw the attention of our Fellows, and entomologists generally, to the backward position we occupy in this branch of zoological study.

No one man has, or could have, sufficient knowledge of all orders to work out a scheme of geographical distribution for insects generally; but we might individually do a good deal to throw light on the subject, in order to see how far the facts, as far as we are able to judge, agree with those derived from the study of plants, mammals, and birds.

I hope eventually to review the subject more completely; but in writing of the regions where I have personally travelled and collected, and of whose butterflies I have a fair knowledge, namely, Europe, Asia, and North America, I find so many doubtful and difficult questions, that I thought it best not to attempt more than a slight sketch of the affinities of regions like South America, Africa, and Australia, whose butterflies I know but very slightly, from the writings and observations of others; and shall, therefore, touch but very lightly upon them at present.

In attempting to compare the distribution of insects with that of birds, animals, or plants, we are met by two great difficulties, which must make any exact definition of the regions and sub-regions impossible at present. One is the want of knowledge as to the insect fauna of many of the most important areas of which the animals, birds, and plants are

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fairly well-known. The second is the uncertainty of the classification which at present exists in many of the most important groups. It would seem, as far as one can judge from what we do know, that the families and genera of butterflies are more cosmopolitan in their distribution than those of either animals or birds; but this may be partly owing to the fact that the recognised genera are not so much sub-divided.

And on the question of sub-division of genera I must say a few words. Since the publication of Westwood and Doubleday's work, many years ago, there has been no attempt made, so far as I know, to revise the genera of butterflies except in Schätz's (continued by Röber) 'Familien und Gattungen der Tagfalter,' published in 1892, as a volume of the 'Exotische Schmetterlinge' of Staudinger and Schätz.

This is a careful and fairly complete work, based on an analytical study of the rich collection of Dr. O. Staudinger, but the genera adopted are so large in many cases, that some extent of sub-division seems necessary for purposes of convenience. The very numerous sub-genera proposed, though insufficiently characterised, by Moore, Butler, and Scudder, but in many cases not accepted by other lepidopterists, are not sufficiently criticised by Schätz, and genera such as Satyrus, containing many divergent species, are adopted *en bloc*. Some of our best systematists, of whom Messrs. Godman and Salvin are the leaders, consider that it is impossible to sub-divide large cosmopolitan genera such as Thecla in a satisfactory way when dealing with local faunas, and in this I fully agree with them. We have a good recent instance of the extent to which the contrary system may be carried in Scudder's 'Butterflies of the Eastern United States and Canada.' In his preface, p. ix., Mr. Scudder attempts to justify this practice by saying, "if the characters I "have pointed out, as pertaining to such groups and their "relations to those placed above and below them, are not "in themselves a justification, then I have none, and no "words of mine could or should alter such a fact; if, however, these characteristics represent actual categories, "and if, at the same time, such groupings make clearer the

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" relations which the life histories and the distribution of " the groups bear to their structure, then words are not " needed."

Now let us apply these excellent principles to the way in which Mr. Scudder has acted.

He allows *Œneis maccouni* to remain in the same genus with *Œ. semidea*, though there are not perhaps in the whole genus two species more divergent in their general appearance, habits, and distribution than these; *maccouni* representing a group characteristic of the Coniferous Forest of the Pacific coast, the other being typical of the most Arctic form of the genus, found on high mountain summits and ice-swept coasts. On the other hand, he makes out of the twelve species of Thecla found in his region six genera, of which four are said to be restricted to America, though it is evident that the author has little acquaintance with the genera of the Neotropical region. Amongst them *Incisalia* is said to be confined to the United States, but closely allied to the European *Callophrys*, Billberg, of which he gives* our *Thecla rubi* as type; but does not mention *Thecla dumetorum* from California, which is so close to *rubi* that I cannot distinguish them without the labels, and I find much variation in the characters by which *Incisalia* is defined. Thus I am justified in saying that until Scudder shows us how to distinguish *rubi* from *dumetorum* and *Callophrys* from *Incisalia*, the latter genus is not at present to be relied on for the study of distribution.

Moore carries the same practice as far as Scudder, and though he attempts by analytical tables to characterise his so-called genera, they cannot be accepted on his authority alone, though, no doubt, some of them are based on good characters. In dealing with the Indian Satyrinæ, he has apparently, without reference to their allies in other parts of Asia, Africa, and Europe, sub-divided *Ypthima*, *Satyrus*, and others into many so-called genera bearing names such as Chazara, Crebeta, Hemadara, Kanetisa, Kolasa, Karanasa, Thymipa, etc., which being without meaning or sense, are very hard to remember.

* Scudder, Gen. Butt. in Proc. Amer. Acad. Sci. Boston, 1875, p. 132.

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If I adopted them and based a study of the distribution of Indian Satyrinæ on them, I should probably arrive at grossly distorted and unreliable results.

This being the case in regions which have been well worked, and of which the butterflies are fairly known, how much more difficult it is to decide as to regions which, like many parts of Africa, are almost unknown. I cannot dismiss this part of the subject without referring to some remarks by Canon Tristram, F.R.S., in the Ibis for January, 1895, p. 130. He says,

"The question is:—Is the multiplication of genera, each "containing one or two species and those closely allied, an aid "or a hindrance to the study of the subject? To quote the "words of Dr. Bowdler Sharpe on another point in nomen- "clature, and which I would apply to many of the new- "fangled genera, 'An arrangement we shall never adopt, "'as we consider it a clumsy and unnecessary method of "'nomenclature, and one that in the hands of unscrupulous "'writers may be employed *ad lib.* to gain a little tem- "'porary notoriety and end in making the study of birds "'impossible. Can any science bear the weight of such "'a system of nomenclature?'"

I say decidedly, No.

The Rhopalocera are perhaps the best adapted for analysis, as being better known and less numerous than Coleoptera or Heterocera, but as soon as you begin to compare lists of butterflies from different regions and sub-regions with the object of finding out the proportion of peculiar genera and species characteristic of them, you are at once involved in a host of minor difficulties arising from the two causes above mentioned. And though one is able to give the general features of the butterfly fauna of many of the sub-regions, one cannot be sure how far their relative degree of specialization may not have to be modified by future discoveries and better systems of classification based on larger materials for study.

Shortly after the publication of Dr. Sclater's classical paper on the Distribution of Birds, Mr. W. F. Kirby published, in the Journal of the Linnean Society, Zool., Vol. XI., p. 431, 1873, a short paper on the Distribution

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of Butterflies, which was, as far as it went, quite in accordance with the facts then known, but is now somewhat out of date; and, moreover, errs in this respect, that many of the genera mentioned as characteristic are, from my point of view, not truly so. For I cannot regard as characteristic forms, genera which are not present throughout the greater part of the regions which they belong to, or which are found in equal abundance in other regions; but rather I consider those as characteristic which are dominant in number of species, found almost everywhere in these regions, and not in others, except in isolated cases or as stragglers.

Dr. Adalbert Seitz has written a long and interesting paper in the Zoologischer Jahrbücher of Jena, vol. v., pp. 281—343, on the 'Geographical Distribution of Butterflies and its Dependence on Climatic Influences,' in which he attempts, *inter alia*, to show that the influence of trade winds has largely contributed to the abundance and variety of Lepidoptera in various parts of the world, and, so far as trade winds have affected the abundance or scarcity of vegetation, there is no doubt some truth in this; but this theory is utterly insufficient to account for many of the most remarkable features we meet with; and though it is easy to find facts to prove almost any theory in such investigations as this, yet Dr. Seitz's knowledge of many of the faunas which he mentions in proof of his theory is evidently very slight. He attributes to the influence of trade winds a fact which is only partially true, viz., that islands lying in the path of trade winds eastward of continents, such as Cuba, Madagascar, the Philippines, Borneo, and Formosa, are all very rich in insects, whilst islands lying to the west of continents out of the course of a trade wind, are usually poor in insects.

He ignores the difference between oceanic islands surrounded by deep seas which have probably been long isolated, and continental islands surrounded by shallow seas which in former ages were probably connected with continents.

I am myself disposed to consider that the influences which contribute principally to the development of a large number of species and individuals of Rhopalocera, are largely climatic.

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In temperate and cold regions, the prevalence of regular seasons having a warm and sunny summer, with a dry and cold winter, and in tropical regions abundant rainfall, coupled with sufficient sunshine, being the conditions which favour abundance of individuals. A great range of elevation in a limited area has an overwhelming influence on the number and variety of genera.

One would reasonably suppose that as the greater number of Lepidoptera depend on plants alone during their larval stage of existence, their distribution would closely coincide with that of plants. So far as I am able to judge, however, the general features of their distribution agree far better with that of birds than with that of plants.

The best general *resumé* of the distribution of the plants I know is that by Mr. W. B. Hemsley, F.R.S., in his introduction to the botanical part of 'Biologia Centrali-Americana,' published in 1888; and I am glad to see that in this admirable paper the same principle of working out the facts is adopted that I had previously used in 1873 in my paper on the 'Distribution of Asiatic Birds,'* namely, by percentage. Wallace states that nothing like a perfect Zoological division of the earth is possible, and in this I quite agree with him. But when Wallace, Sclater, and Sharpe are so nearly agreed, the main difference between them being that Sclater makes the Pacific region separate from the Australian, whilst Wallace and Sharpe unite them as a primary division, it is clear that there cannot be any great error in their conclusions.

Hemsley suggests two alternative schemes, in one of which he admits as primary botanical regions the following:—

1. Northern, corresponding to the Palæarctic and Nearctic regions of Wallace, Sclater, and Sharpe.
2. African, corresponding to their Ethiopian region.
3. Indian, corresponding to their Indian region, with the addition of the Austro-Malay sub-region of Wallace.

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* Proc. Zool. Soc, 1873, pp. 645—682.

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4. South American, corresponding with the Neotropical region of Zoologists.
5. Australasian, corresponding with the Australian region of Wallace and Sharpe, less the Austro-Malay sub-region, and with the Pacific and Australian region of Sclater, less the same sub-region.

Hemsley's alternative primary division, which he says is more in accordance with the writings of many botanists, is as follows :—

1. Northern Region.
2. Neotropical.
3. Palæotropical.
4. Andean.
5. Cape.
6. Australasian.

In both his divisions he omits two small but exceptionally interesting floras, namely, those of the Sandwich Islands and Antarctic regions, which though not large enough to be treated as primary regions, cannot be consistently included in either of the others.

Sir Joseph D. Hooker in reviewing Hemsley's arrangement on pages lxv.-lxviii. of the same work, states that though he disputes neither his facts or his methods, yet he differs from him to some extent in his limitation of the primary floras of the globe, and divides the world into two primary regions or Botanical Empires, Tropical and Temperate, which he again divides into the following regions or Botanic Kingdoms :—

1. The North Temperate region of the Old World.
   This coincides with the Palæarctic region of Sclater, except that it includes Greenland.
2. The North Temperate region of the New World.
3. The Tropical region of the Old World.
4. The Tropical region of the New World.
5. The South Temperate region of America.
6. The South Temperate region of Africa.
7. The South Temperate region of Australia.

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Prof. Thistleton Dyer, F.R.S., in an admirable lecture on 'Plant Distribution as a Field for Geographical Research,'* admits three primary floras:—

1st. The Northern Flora, practically the same as Hemsley's northern region, which he divides into—

1a. The Arctic Alpine.
1b. The Temperate.
1c. The Mediterraneo-Caucasian.

2nd. The Southern Flora, divided into—

2a. The Australian.
2b. The South African.
2c. The Temperate South American.
2d. The Antarctic Alpine.

3rd. The Tropical Flora, divided into—

3a. The Asiatic.
3b. The American.
3c. The African.

There is really no great difference between the views of these three most competent authorities, except in the value that is attached by them to primary and secondary divisions. Hooker, it is true, whose personal knowledge, gained by travel in many of these regions, which alone will enable a man to appreciate the physical features of the earth's divisions in the highest degree, seems to consider the north temperate regions of the old and new world as divisions of primary importance, and in this agrees with most zoologists: whilst Dyer and Hemsley agree in uniting them. But, judging from the study of butterflies alone, I say without hesitation that the Nearctic and Palæarctic regions are inseparable, and that the Nearctic region has fewer peculiar endemic genera and species than the Mediterranean-Asiatic, or, as I call it, Mediterraneo-Persic sub-region; and, in consequence, I believe that the Nearctic or North Temperate region of the new world, is at best a sub-region or province of the great Temperate or Palæarctic region. It is true that a number of species and some genera occur all over the United States, which are not Palæarctic, and that in the Gulf States, New Mexico,

* Proc. Royal Geogr. Soc., vol. xxii, 1878.

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Arizona, and Southern California these may give an absolutely un-European appearance to the lepidopterous fauna; but when you come to examine these elements you will find nothing, or almost nothing, of an endemic or peculiar character amongst them.

What you do find are—

1st. A number of stragglers or immigrants from the Neotropical region, belonging to cosmotropical genera, such as *Papilio*, *Callidryas*, *Terias*, *Danais*, *Junonia*, and *Thecla*.

2nd. A few purely Neotropical butterflies, such as *Heliconia charitonia* (in the Gulf States only). *Leptalis*, one species; *Meganostoma*, two species; four or five species of *Erycinidæ*; one species of *Eurema*; one of *Paphia*, and a few others almost entirely confined to the borderland of Texas and New Mexico, or to Florida, where the vegetation is subtropical.

3rd. Several species of *Phyciodes* and *Neonympha*, which, though Neotropical rather than European, have extended their range throughout a great part of the United States, but of which *Phyciodes* only is a constantly-present and dominant genus.

4th. Three species belonging to monotypic genera confined to very limited areas in the United States, viz., *Feniseca Tarquinius*, which occurs in various spots east of the Rocky Mountains, from Maine to Missouri and Florida, but usually a scarce or local species; a butterfly of very obscure alliance, but having a marked superficial resemblance in form and colour to the curious Malayan *Liphyra brassolis*, with which also it agrees in the aphidivorus habit of its larva. *Neophasia menapia*, a monotypic Pierid confined to the pine forests of the Northern Pacific States, and *Neominois Ridingsi*, which is found on the western slopes of the Rocky Mountains.

If we adopt Scudder's genera, this number would be increased, but I have shown reasons for not doing so, until they are better established by a study of the allied forms in other regions.

Among the *Hesperiidæ*, it is true, the apparently Neotropical element in places overwhelms the Palæarctic forms; but in

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this family the classification is not sufficiently certain to enable us to analyse the generic distribution, though Watson's 'Revision of the *Hesperiidæ*,' * based on a somewhat hasty study of the species in the British Museum, shows that the majority of the American genera, and some of the subfamilies, are confined to the Neotropical region.

Among the Heterocera the Neotropical element appears to be greater than among the Rhopalocera; but here again we have not sufficient knowledge. Packard, in his Monograph of the Geometrid Moths of the United States,† gives a good account of their distribution (pp. 567, *et seq.*), with lists of the species inhabiting the east and west of the United States of America; but he does not compare these lists with those of Europe, and the European genera he mentions as not found in the United States, are probably subject to much modification at the present time.

He states, however, two facts, which I can abundantly confirm from my personal knowledge of the Western butterflies, namely, the absence on the Pacific slope of forms characteristic of Japan and China, and the presence there of some European types which do not occur in the Atlantic States.

One of the most remarkable facts about the plant distribution of North America is that which has been abundantly proved both by the late Dr. Asa Gray and Sir J. D. Hooker, namely, the resemblance between the flora of the Eastern States and that of North-east Asia, whilst almost every characteristic form in the vegetation of the Atlantic States is wanting in California. There is, however, as far as I know, but little trace of a corresponding Japanese or Chinese element amongst the Lepidoptera, except the following:—

Midea, Herr-Schaeff, a section of the genus *Anthocharis*, comprising four known species, of which one occurs in the Alleghany States, one in California, and two in China and Japan; and *Achalarus*, of Scudder, of which two species, as recognized by him, are found in the Southern States east

* P. Z. S., 1893, pp. 3, *et seq.*

† U. S. Geological Survey, Vol. X., 1876.

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of the Rocky Mountains, one extending into Mexico, and the other, *A. lycidas*, to the southern portions of New England. Of the remaining species, *A. liliana* ranges from the Naga Hills to Yunnan, *A. bifasciatus* is found in North China, and three or four more nearly allied species in Central and Western China.

This is the more remarkable, because of the extraordinary resemblance between the Lepidoptera of the Rocky Mountains of Colorado, Montana, and Alberta, and those of Northern Europe and the Alps. This resemblance was, I think, first pointed out by Packard in a paper on the Geographical Distribution of the Moths of Colorado;* but it is not there shown with anything like the force that later and better knowledge of the high-level insects of the Rocky Mountains afford.

I have had personal experience of this in two collecting trips to the Pacific and Rocky Mountain States, and was astonished at the number of butterflies, identical with or very closely allied to those of Europe, which occur at high levels in Colorado and Alberta, and the small number of species which belong to non-European genera. I have not yet been able to bring together the results of these journeys, as I hope to do when I have explored the higher mountains of Montana, Wyoming, and Idaho; but I am convinced that many of the species which have been separated by W. H. Edwards and others are identical with European forms.

A few of the most striking examples are shown among the specimens I have brought here, and I would call special attention to *Erebia magdalena*, *E. tyndarus*, *E. epipsodea*, *E. sophia*, and *Cœnonympha typhon* among the Satyridæ; *Argynnis chariclea* and *A. freya* among the Nymphalidæ; *Papilio machaon* amongst the Papilionidæ; *Colias hecla*, *C. nastes*, *Anthocharis ausonides* among the Pieridæ, and *Pamphila palæmon* and *Hesperia centaureæ* among the Hesperiidæ.

There can be no doubt that the subdivisions proposed by Dr. Bowdler Sharpe, in his admirable paper on the 'Zoo-Geographical Areas of the World, illustrating the distribution

* Ann. Rep. U. S. Geological Survey for 1873, p. 543, *et seq.*

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of birds,'* are too minute to be adopted for butterflies, and I should be disposed at present only to admit the following :—

1st. The *Boreal*, which would probably include his first four subregions, namely the *Arctic*, *Alaskan*, *Aleutian*, and *Cold Temperate*. Though we know almost nothing of the 2nd and 3rd, we cannot expect many Lepidoptera to exist there ; and the other two, including the higher elevations of the Rocky Mountains and of California, are inseparable from the *Boreal* region of Europe and Asia, and coincide with the *Polar* and *British N. American floras* of Hooker.

2nd. Sharpe's *Humid Province*, which he divides into the *Appalachian* and *Austro-riparian* subprovinces, and which coincides with the *Great Eastern Forest Region* of Hooker†, of which the Southern, especially a part of the Littoral area, is so largely tinged with a West Indian element, both in plants and butterflies, but not apparently in birds, that it forms a transition area to the Antilles.

3rd. Sharpe's *Arid Province*, which includes his *Campestrian* and *Sonoran sub-Provinces*, and the southern part of the *Prairie Region* of Hooker, together with the great deserts of Utah, New Mexico, Arizona, and Western Texas, which is characterized by the comparative scarcity of most of the dominant northern genera, and shows a Mexican and Neotropical element by the presence of many *Hesperiidæ*, a few *Erycinidæ*, and other genera not found to the north, and for the most part represented by a few species with Mexican affinities.

This forms a transition area to the Mexican Province of the Neotropical region, and being almost entirely a region of great aridity, and without forest, forms, in the same way as the African Sahara does, a barrier to the northern extension of all the Neotropical species which inhabit forests.

I have mentioned these divisions in greater detail, because it is clear, from the remarks of Dr. Dixey in a recent paper in our Transactions (Trans. Ent. Soc., 1894, p. 322), that there is

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* Natural Science, Vol. III., Aug., 1893.

† The Distribution of the North American Flora. A lecture delivered on April 12, 1878, before the Royal Institution of Great Britain. 'Gardeners' Chronicle,' Aug., 1878.

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great confusion in the minds of some entomologists as to the affinities of these regions.

Mr. Salvin informs me that the boundary, though somewhat indefinite, must be drawn through Northern Mexico, and coincides closely with the region of forest.

Judging from the little I was able to see of the butterflies during the short time I spent in the Highlands of Central Mexico, at a season unfavourable for collecting, the northern element is there far weaker than among birds, two species of *Grapta* being the principal evidence of it; and is by no means so well marked as in the high Andes of Ecuador, Bolivia, and Chili, where several species of *Argynnis* and *Colias* are found, together with other genera resembling, if not very closely allied to northern forms, which do not exist in the Highlands of Mexico.

Of the Andean and Chilian butterflies we know too little to analyse their elements. Butler's paper,* although probably very incomplete, is the best on Chili; and Staudinger's 'Hochandine Lepidopteren' † is of great interest. It seems, however, pretty certain that the genera do not show anything like the necessary amount of divergence from those of the Neotropical region to support the separation agreed in by three such eminent botanists as Hooker, Dyer, and Hemsley, of an Andean or Temperate South American region.

What is most remarkable is the existence, at high elevations in various parts of the Andes, and at sea level in South Chili and Patagonia, of several genera and species elsewhere unknown in the Neotropical region, and which are isolated from their congeners in North America by an enormous area of country.

Among these *Trifurcula huanaco* is a remarkable species which occurs in the Andes of Bolivia, at 16,000 to 17,000 feet, and has a marvellous likeness to *Baltia shawi*, found at a similar elevation in Ladak.

Phulia, a genus of three or four nearly allied species, also

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* List of Butterflies collected in Chili by T. Edmonds, Esq., Trans. Ent. Soc. Lond., 1881, p. 449–486.

† Iris. Dresden. Band vii., p. 43, 1894.

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occurring at great elevations in the Andes and Chili, has a striking resemblance to *Synchloe Butleri*, a species which accompanies *Baltia* in Ladak. If similar conditions of environment do not produce similar effects, how can these extraordinary cases of resemblance in remote and disconnected areas be accounted for?

But the Chilian *Satyridæ* are the most numerous and peculiar of these mountain forms. Of seventy-two species recorded by Butler from Chili, no less than thirty-two are *Satyridæ*, including several endemic genera, which resemble if they are not congeneric with *Epinephele*, *Erebia*, and *Hipparchia*, of the northern region.

Argyrophenga and *Argyrophorus* are two genera of most striking coloration, on account of the metallic silvery colour of the upper surface, whose only near ally is the still more remarkable *A. antipodum* of New Zealand.

Next I may notice some species of *Argynnis* which, though of a type different to anything in the North Temperate region, as *A. inca* and *A. cytheris*, have not been generically separated, and four or five species of *Colias*, a genus which occurs from Ecuador to the Straits of Magellan.

Of butterflies found on the eastern side of extra tropical South America, I know none of Northern type except *Colias lesbia*, and a species described as *Œneis antarcticus*, Mab., which I have never seen. *Euryades*, however, is a genus of very remarkable structure, having an extraordinary horny excrescence on the abdomen of the female, analogous to that found in *Parnassius*, in *Luehdorfia* from N. E. Asia, and in *Eurycles* from Australia. These four genera are the only ones in which this appendage is observed, though there is something like it in *Pareba*. I showed in my paper on 'Parnassius' * that this organ was developed during copulation, but its function still remains unknown.

With regard to the butterflies of the Neotropical region I shall say nothing, as I know too little of them, and they are better left to those who have made this region a special study. Mr. Salvin, the highest authority on the subject, does not see his way to subdividing it on the butterflies without going

* Proc. Zool. Soc. 1886, p. 6, *et seq.*

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into elaborate statistics, which neither my time nor space would allow me to introduce here. But his general impression is, that when the forms of the higher Andes and extreme South are eliminated, no very marked divisions exist. He points out that the great features of the region as a whole, when contrasted with the rest of the world, are—the presence of peculiar subfamilies, such as *Heliconinæ* and *Brassolinæ;* the enormous development of *Ithomiinæ* (a section of *Danaiinæ*) to the exclusion of *Euplœinæ;* the large number of characteristic genera of *Nymphalinæ* and *Morphinæ*, as well as of *Satyrinæ;* the vast extent of *Erycinidæ* as compared with their poverty in other regions; the presence of the highly peculiar *Dismorphinæ* (*Pieridæ*), and wholly peculiar species of *Papilionidæ;* the comparative poverty of true *Lycœnæ*, in place of which *Thecla* is vastly developed. And I would add the enormous development of *Hesperiidæ*.

I find in Watson's paper on this family, above alluded to, that out of some two hundred genera recognized by him in the whole world, about half, including the whole of the subfamily *Pyrrhopyginæ* and almost the whole of his first section of *Hesperiinæ*, are confined to the Neotropical, while about seventy occur in the Indian, and thirty only in the Ethiopian region. And at certain seasons and places, as I found at Orizaba in Mexico, in March, the species of *Hesperiidæ* outnumber the species of all the other families together.

Now let us turn to the Old World section of the Northern region, of which the butterflies are better known than those of any other region. Though some of the genera, such as *Satyrus*, *Pararge*, and *Lycœna*, require subdivision to bring their generic value into accordance with those adopted in the Indian region, we have no great difficulty in reviewing them.

I recognize four sub-divisions of this region :—

1. The *North American*, which I have already dealt with.
2. The *Eurasian*, which extends from Britain to N. E. Siberia, and coincides with that adopted by Sharpe.
3. The *Mediterraneo-Persic*, or Mediterraneo-Asiatic of Sharpe.

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4. The *Eastern Temperate*, which includes the Mantchurian and Mongolian provinces of Sharpe in part—though a great part of these provinces have more affinity with the Himalo-Chinese subregion, and are difficult to separate from it. *Cf.* Elwes on the Butterflies of Amurland, North China, and Japan.*

The following genera are characteristic of the North Temperate region.

Parnassius is absolutely confined to it, and has its greatest development in the eastern part of the Eurasian sub-region, but is poorly represented by two or three species in North America.

Doritis, *Thais*, and *Hypermnestra* are small genera confined to, but hardly characteristic of, the Mediterraneo-Persic sub-region.

Luehdorfia and *Sericinus* are strictly confined to, but hardly characteristic of, the East Temperate sub-region.

Of the *Pierina*, *Leucophasia* is confined to, but not specially characteristic of, any part of it.

Mesapia, *Davidina*, and *Baltia* are small genera confined to the highest altitudes of Tibet.

Colias is one of the most widely distributed and dominant genera over the whole region at all altitudes, especially well developed in Alpine regions, and extending as far north as any butterflies. It has developed some outlying species in other regions, as *C. nilgherrensis* in South India, *C. imperialis* in Patagonia (?), and five species in extra-tropical South America and the Andes. It also extends to various parts of Eastern and South Africa, but nowhere, as far as I know, occurs in a strictly tropical climate.

Anthocharis is found almost throughout the region, but is not well developed in any part of it but the Mediteranean and North American sub-regions.

Neophasia and *Midea* I have already spoken of above.

Zegris is still more peculiar, being found only in isolated localities, namely, Andalusia, South Russia, Turkestan, and the South-Western States of North America.

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* Proc. Zool. Soc. 1881, p. 856.

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Of the *Nymphalinæ*, *Argynnis* is the largest, most wide-ranging, and characteristic genus of this region, occurring in every part of it. It has, like *Colias*, developed some outlying species which are somewhat aberrant, namely, *A. hanningtoni* in East Africa; *A. niphe* in India, Australia, and Java; and three or four species in extra-tropical South America. It does not, however, like *Colias*, extend to South Africa.

Melitæa, though it occurs in every part of the region, is more characteristic of Europe and Asia, most of the American species being somewhat aberrant.

Timelæa is confined to North and West China, where there are one or two species only.

Araschnia is found from Western Europe to Eastern Asia and Japan, but not in America; it is hardly characteristic of any particular sub-region.

Grapta, which is perhaps only a section of the cosmopolitan genus *Vanessa*, is found throughout the region, and extends to the Indo-Malayan region and Mexico in isolated cases.

Limenitis is characteristic of the whole region in a minor degree, but it is also well-represented in the Himalo-Chinese sub-region, and on this account should perhaps be excluded.

Of the *Satyrinæ*, *Pararge* is not a very homogeneous genus, but its more typical species are widely spread, not, however, extending to North America.

Cœnonympha is very widespread and characteristic of every part of the region, except the Eastern States of North America, where it is absent, though everywhere present in the North Western States and California.

Erebia is a very dominant and wide-ranging genus, specially characteristic of Alpine and Arctic regions. There is no true *Erebia* outside the region, but two doubtfully congeneric species are found in the mountains of New Zealand.

Satyrus is a very well developed and characteristic genus of the Eurasian sub-region, but is scarce or absent in the North American and East Temperate.

Epinephele has almost the same distribution as *Satyrus*, but is absolutely wanting in North America.

Melanargia is a very well marked and peculiar genus, characteristic of the Eurasian sub-region; one or two species

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extend to Eastern Asia, but none are found in North America.

Œneis is somewhat similar in its distribution to *Erebia*, and is characteristic only of Alpine and Arctic districts, though some species in Europe, Asia, and America are confined to grassy steppes having an extremely cold winter climate.

The *Erycinidæ* are represented only by two small almost monotypic genera, *Nemeobius* in Europe and *Polycæna* in Central Asia.

Among the *Lycænidæ*, notwithstanding the general abundance of the family throughout every part of the region, hardly a single genus can be called characteristic of it, and only one, which is monotypic, is peculiar to it, namely,

Læsiopsis roboris, confined to South-Western Europe.

Cigaritis and *Thestor* are two small genera, almost confined to the Mediterraneo-Persic sub-region, and both seem to be of African affinity.

Chrysophanus or *Polyommatus* is largely developed throughout the whole region, of which it is highly characteristic, though several species are found also in the Himalo-Chinese sub-region.

Lycæna is a very dominant genus, which, until its species are grouped into the genera adopted by de Niceville on the Butterflies of India, cannot be analysed for my present purpose. It is not more characteristic of the region, however, than of the Indo-Malayan.

Hesperiidæ.—In reviewing the *Hesperiidæ* of this region, to see how far they may agree with the distribution of other families, I have adopted the genera defined by Watson. A careful paper by Dr. A. Speyer on the genera of the European *Hesperiidæ*, with special reference to their occurrence in North America, was published in the Stettiner Ent. Zeit., 1878, pp. 167-193, and is translated by A. J. Lintner in the Canadian Entomologist, 1878, pp. 121, 144, 163, *et seq.*

I have not been able to accept the conclusions of this paper either as regards the genera adopted, or the statement that no species except *H. centaureæ* is common to Europe and North America, because the materials at Speyer's dis-

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posal were absolutely insufficient for the work he undertook. Watson's arrangement, though not by any means final, is based on a much wider study, and the revision which I am now engaged on, with the assistance of Mr. J. Edwards, of his genera, so far as they are found in the North Temperate and Indian regions, leads me to prefer it to Speyer's.

Carcharodus, Hubn. (Spilothyrus apud Staudinger, Pyrgus in part apud Speyer) has three or four species occurring in Europe and West Asia, but all characteristic of the Mediterraneo-Persic sub-region, and absent from N. America.

Hesperia, Fabr. (Syricthus apud Staudinger, Scelothrix apud Speyer) is the most numerous of all the genera in this region, but is cosmopolitan in distribution, though poorly represented in N. America. Over twenty species may be distinguished, and probably more exist, as Mr. J. Edwards, in studying the genital organs of the species in my collection, has found constant and striking differences, which he considers of specific value, between *H. malvæ* and what is here shown as *H. distincta*

Thanaos (Nisoniades apud Staudinger) is widely spread throughout the region and in N. America, where it seems most abundant.

Adopæa (Hesperia in part apud Staudinger, Thymelicus pt. apud Speyer), of which *A. thaumas* is typical, according to Speyer, occurs sparingly throughout the region, and also in N. America, if *T. garita* is congeneric, as Speyer asserts.

Erynnis, Schranck (Hesperia in part apud Staudinger, Pamphila part apud Speyer), is also very widely spread, and perhaps most of the supposed species composing it may be regarded as forms of *E. comma*.

Pamphila, Fabr. (Carterocephalus apud Staudinger and Speyer), is a small genus represented in Northern Europe, Asia, America, and E. Tibet.

Heteropterus (Cyclopides apud Staudinger and Speyer), a small genus peculiar to N. Europe and Asia. *Butleria aureipennis*, from Chili, seems to be a representative form.

Gegenes, Hubn. (Hesperia in part apud Staudinger, Goniloba apud Speyer), is a genus of African affinity, only occurring in the Mediterraneo-Persic sub-region.

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There are also a few species, mostly of Indian genera—but in one case *Achalarus* only found elsewhere in the U.S.A.—which occur in the extreme east of the North Temperate region, such as *Ismene aquilina*, *Satarupa nymphalis*, *Aeromachus inachus*, and one small genus, *Augiades*, of which *A. sylvanus* is the type, which has its headquarters in the Himalo-Chinese sub-region.

Ethiopian Region.—Of Africa, as a whole, we have less knowledge than of any other region of so large an extent. Many collections and local lists of butterflies from various parts of tropical Africa have been made, but none of them have any pretension to being at all complete, and, as far as I can judge, they give no data sufficient to decide whether the sub-regions which are recognized for birds will hold good for butterflies. *Cf.* Kirby.*

It seems, however, that the insects of tropical Africa are widely distributed from west to east, and extend on the south-east coast to Natal, whilst those of the more arid parts of North-Eastern Africa are comparatively poor in endemic genera, and rich only in species of *Acræa* and *Teracolus*. When we come to South Africa, a country so rich in its flora that it is considered by botanists to form a region apart, we find the poverty of butterflies even more striking.

Mr. Trimen's remarks on the subject are worth quoting.† "There can be no doubt that, with the exception of the "eastern coastbelt, from about the Kei river to Delagoa Bay "and Inhambane, South Africa is very scantily supplied with "butterflies." "So accustomed are we to associate butter-"flies with flowers, that I well remember how much the "dearth of these insects surprised and disappointed me when "first I contrasted it with the unrivalled variety and beauty of "the flora of the Cape district."

"I believe that when the Cape flora comes under investiga-"tion as regards fertilization by insect agency, it will be found "that a great proportion of its large and brilliant blossoms are "adapted to the visits of Diptera, and a good part of the

* The Butterflies and Moths of Africa, a paper read before the Victoria Institute, June 3, 1889.

† South African Butterflies, vol. i., p. 42.

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" remainder for those of Hymenoptera. The great number " of densely hairy flower-frequenting Coleoptera in South " Africa must also play a large part in plant fertilization."

" A residence of nearly twenty-five years at Capetown " enables me to state with some certainty that the species " inhabiting the neighbourhood do not number more than " forty-seven."

" This remarkable poverty of butterflies is rendered all the " more striking from the circumstance that twenty-nine of " the species are small Lycænidæ (twenty-two) and Hesperiidæ " (seven), and the bulk of the remainder consists of sombre " Satyrinæ (ten) of medium size."

" It is only when we progress eastward along the belt " between the first mountain range and the sea-coast that " the Rhopalocerous fauna finds conditions more favourable " for its development. Thus, at Knysna, where extensive " forests of large trees clothe a large area, I collected, during " nine months' residence, sixty-two species."

" Across the Kei river, Colonel Bowker collected one hun- " dred and seventeen species, and it is only when we reach " D'Urban, on the coast of Natal, that the augmentation in " their ranks is remarkable. At this spot the Rhopalocera " become a constant and beautiful feature of the scenery."

Mr. Trimen goes on to remark that he took in one day, near Natal, no less than fifty-four species, which, however, is less than I have taken in one day, with Mr. Salvin, in the Italian valleys of the Alps.

It is not more easy to account for this poverty at the Cape than it is in South and West Australia, where, notwithstanding a rich, varied, and peculiar vegetation, we have extreme poverty in the Rhopalocera. The desert country which separates the Cape Colony from tropical Africa on the north, is, no doubt, a good natural boundary against the extension southwards of tropical forms, for which the climate of littoral South Africa would appear to be far better adapted than the coast of Korea and South Japan are for the tropical Indian forms of butterflies which we find there; or than the coast of New England for some forms of Neotropical affinity which extend so far north; but though the

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desert may have prevented the migration from the north, the tropical coast-line on the south-east would have formed no obstacle to the extension of many East African tropical species to the Cape Colony.

It is perhaps a question on which zoologists are not agreed, whether the Ethiopian region should be considered a region of primary value or be united with the Indian into a Palæotropical region, as is done by Hooker and in Hemsley's alternative scheme.

I am not prepared to accept the latter course. There are, no doubt, a great number of dominant genera, which are common to both continents; but the almost total absence of some of the most typical and dominant Malayan genera in Africa, such as *Euplæa*, *Ornithoptera*, *Delias*, *Neptis*, *Amblypodia*, and the presence in Africa of many large genera which are almost, or quite, absent in India, such as *Acræa*, *Euryphene*, *Romaleosoma*, *Axiocerces*, *Pentila*, etc., quite outweighs the fact that some rather numerous groups, such as *Mycalesis*, *Ypthima*, *Charaxes*, *Hypolimnas*, *Eurytela*, are common to both.

Of Madagascar and the Mascarene islands, which, on account of their many peculiar genera of mammals and birds, stand quite apart from Continental Africa, I cannot say much, as the only comprehensive account of the butterflies we have, by Saalmuller,* is too incomplete to analyse with profit. A large number of peculiar species occur, and some of them show Malayan rather than Ethiopian affinities. It has the only two species of *Euplæa* which are found out of the Malay region; also a single species of *Hypanartia* and *Crenis*, which are Neotropical genera. The beautiful moth *Urania Ripheus*, is also a striking instance of a genus found nowhere else but in South America; but, according to Schatz, *Heteropsis* is the only genus of butterflies peculiar to Madagascar.

Indo-Malayan Region, or East Tropical Region of the Old World.—No other region, except the Neotropical, is anything like so rich in peculiar, dominant, and characteristic forms

* Lepidopteren von Madagascar, vol. *i.*, Frankfort, 1884.

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as this. It may be subdivided with greater ease and convenience than the North Temperate; but, with the exception of the Himalo-Chinese sub-region, its divisions do not coincide very well with those adopted by Mr. Sharpe or myself for birds. What I called the *Indian sub-region*, and Sharpe calls the *Indo-Peninsular sub-region*, has almost no peculiar forms among butterflies, which are not equally abundant in, and characteristic of, a great part of the Ethiopian region. In the cultivated plains and jungles of Peninsular India, the dominant genera are all either cosmopolitan, like *Papilio*, *Lycæna*; cosmotropical, like *Terias*, *Catopsilia*, and *Junonia*; or abundant in Africa like *Teracolus*, *Idmais*, *Danais*, *Precis*, *Messaras*, *Atella*, *Ergolis*, *Hypolimnas*, *Charaxes*, *Mycalesis*, *Ypthima*, *Aphnæus*; or Indo-Malayan, like *Delias*, *Ixias*, *Eronia*, *Neptis*, *Lethe*, *Elymnias*, *Curetis*.

Excepting the monotypic *Parantirhæa*, confined to the mountains of Travancore, and therefore belonging to the Indo-Malayan sub-region, I know of no genus of butterflies peculiar to the Peninsula of India. I will therefore strike it out, and include it as a province only of the Indo-Malayan sub-region, forming a link with the Ethiopian region.

The north-western arid part of the Peninsula, including a great part of Rajputana, Sind, and the Punjab, is in butterflies, as in birds and plants, an eastern extension of the Mediterraneo-Persic province.

An extraordinary case of the recurrence of a species at widely remote spots in this sub-region is that of *Anthocharis charlonia*, which is found in various forms in the Punjab, Mesopotamia, Transcaspian Desert, Algeria, and in the Canary Isles (on Fuerteventura), though I have not seen a specimen from this locality. This range corresponds almost precisely with that of the Desert Bullfinch, *Erythrospiza githaginea*.

The mountains of Southern India, Ceylon, and the Malabar coast must, however, be included in the Malayan sub-region, as they have a larger proportion of Malayan than of African forms, and many of the species found there are peculiar forms of Malayan genera. This part of the Indian region, however, is poor in species and genera as compared with the

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Indo-Malay islands; while the mountains of Ceylon seem especially poor in peculiar forms.

In Mr. Hampson's list of the Butterflies of the Nilgiri district,* only two hundred and seventy-five species are included, of which *Hestia* and *Parthenos* are perhaps the only Malayan genera not found in Sikkim. There is only a single species of *Nemeobiinæ*, one of *Morphinæ*, and two of *Amblypodia*, all of which are characteristic of the Indo-Malay region. *Zipœtis* is, perhaps, the only genus not found in the Himalayas which occurs here, and *Colias nilgiriensis* is a unique instance of a Northern genus which extends so far south, showing that an insuperable obstacle has been opposed by the low and hot plains and the arid hills of the Peninsula to the extension southwards of either Northern genera from the north-west or Himalayan forms from the north-east.

The dominant and characteristic genera of the Indo-Malay region, as a whole, are not very numerous, but for the most part have developed in the Malay archipelago a great number of peculiar species.

The following are most conspicuous among them:—

Danais, which, however, is equally well represented in Africa.

Euplœa, which has an immense number of species, and many groups extend to every part of the region.

Cethosia, *Cynthia*, and *Cirrhochroa*, with about thirty species amongst them.

Neptis, with at least ninety species, many of them confined to particular islands, but everywhere, except in the Pacific islands and extra-tropical Australia, a dominant genus.

Athyma and *Euthalia*, with, probably, over one hundred species.

Lethe, *Mycalesis*, *Ypthima*, and *Elymnias* are all dominant genera, but the first is better developed in the Himalo-Chinese sub-region, and the other three are all represented in Africa.

The important though not numerous family of *Morphinæ* is characteristic of the central parts of this region, though entirely wanting in continental Africa. Eleven genera

* Journ. As. Soc. Bengal, 1888.

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and about fifty species occur, of which *Hyantis* alone with one species is peculiar to the Papuan islands; as compared with this we have one genus only, *Morpho*, with about fifty species, in the Neotropical region.

The subfamily *Nemeobiinæ* are almost confined to this region, though two genera with three species occur in the North Temperate region, and four or five species of *Abisara* occur in Southern Africa and Madagascar.

All the rest of the *Erycinidæ*, about eighty-seven genera and one thousand species, are peculiar to the Neotropical region, only a few species spreading to the Southern parts of the United States.

Among the *Lycænidæ* there are many genera which, as far as at present known, appear to be confined to this region, and which form a conspicuous and varied element in Indo-Malayana, but probably many of them will be found to occur also in tropical Africa when that country is better known.

Of the subfamily, *Liptenidæ*, only one, the very rare and curious *Liphyra brassolis*, occurs in various places from Sikkim to the Malay islands.

Amblypodia is by far the largest and most characteristic group among the *Lycænidæ*, and contains with its subgenera probably as many as one hundred and fifty species.

Zephyrus is very characteristic of the Himalo-Chinese region to which it is confined.

Satsuma is a Japanese and Chinese genus, which may have nearer allies in North America than is as yet supposed.

Taraka, *Phengaris*, and *Orthomiella* are all monotypic genera characteristic of the Himalo-Chinese sub-region.

The latter sub-region, which I defined many years ago when writing on the Birds of Asia (Proc. Zool. Soc. 1873, p. 659), has now been generally accepted as a natural and homogeneous one, and though the Rhopalocera do not appear to have developed in it, as many peculiar endemic genera as the birds and plants have done, yet relatively they are fully as rich in species.

There are, however, many well-marked and homogeneous genera entirely confined to the Himalo-Chinese sub-region,

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and nearly all of them have a wide range, from the Himalayas through the mountains of Upper Burmah to the valley of the Yang-tse-kiang. This is evident from a comparison of the list of Chinese butterflies in Leech's recently completed and most valuable work,* with the lists of Himalayan and Malayan butterflies given in my paper on the Butterflies of Sikkim,† where we find that, out of 477 species in China, excluding the Hesperiidæ and a few others which are quite abnormal in their distribution—

145 belong to thirty-four genera which are highly characteristic of, and twenty-four of them absolutely confined to the sub-region.

84 belong to thirty-six genera characteristic of the Indo-Malay region generally, of which two genera, *Euthalia* and *Neptis*, contain thirty-three species, leaving only fifty-one species to the remaining thirty-four genera.

107 belong to genera of North Temperate type, but most of these (perhaps more than half) are confined to the highlands of East Tibet, which more properly form part of the North Temperate region.

45 belong to genera such as *Danais*, *Ypthima*, *Melanitis*, *Charaxes*, *Junonia*, etc., which are common to the Ethiopian region, and

96 belong to cosmopolitan genera.

Out of the first category eight genera, all monotypic, are peculiar to China, namely, *Mandarinia*, *Callarge*, *Palæonympha*, *Isodelma*, *Timelæa*, *Amblopala*, *Davidina*, and *Sericinus*. *Luehdorfia* is found elsewhere only in Japan.

Besides these, the following genera only are not found in the Himalayas:—

Acropthalmia, which occurs in the Philippines.
Midea in the United States.
Polycæna in Central Asia.
Melanargia in Europe and West Asia.
Phengaris in the Naga Hills.

* The Butterflies of China, Japan, and Corea. London, 1892-94, by J. H. Leech.

† Elwes on the Butterflies of Sikkim, Trans. Ent. Soc. Lond., 1888, p. 269.

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The number of genera found in the Himalayas, but not as yet in China, is greater; but it must be remembered that a large part of the very centre of this region, including the head waters of the Irrawaddy, and the greater part of the south-western provinces of China, are as yet quite unexplored. Most of them are Lycænidæ of Malayan type. Among them, perhaps, the following may be mentioned, and of these, the first two only are confined to the Himalayas: *Anadebis*, *Orinoma*, *Zipœtis*, *Elymnias*, *Penthima*, *Neurosigma*, *Allotinus*, *Miletus*, *Nacadaba*, *Horaga*, *Cheritrella*, *Pontia*, *Prioneris*, *Hebomoia* and *Eronia*.

Of typical Malayan genera, not found in the Himalo-Chinese sub-region, the following are the principal:—

Hestia, *Idæopsis*, *Erites*, *Zeuxidia*, *Xanthotænia*, *Prothoë*, *Terinos*, *Rhinopalpa*, and several genera of *Lycænidæ*.

The boundaries of this sub-region are extremely indefinite, as they depend greatly upon altitude, the region being essentially one of considerable elevation. So far as we know at present its outlying districts in the high mountains of the Malay Peninsula, Borneo, Sumatra, and Java, are not as well distinguished by peculiar mountain forms of butterflies as they are by birds. Formosa, of which we know almost nothing, is an island which would probably now repay the exploration of an entomologist better than any other in the Eastern Seas, and the recent discovery of a species of *Hestia*, so far north as the Liukiu islands, shows that there is much of interest to be expected there.

The division between the Indo-Malayan and Austro-Malayan regions laid down by Wallace, and which has since been generally accepted by zoologists as 'Wallace's line,' is much less marked in butterflies than in birds or mammals, and the few traces of an Australian element, which are found to the west of this line, are comparatively unimportant.

In Java, Mr. Snellen, who is now engaged in a work on the Lepidoptera of this island, informs me that though there is a difference between the butterflies of East and West Java yet it is not strongly marked. The greater part of the species are spread over the whole island. *Papilio Van de Polli*, *Pap. Nox*, *Prioneris philomene*, *Delias Peribœa*, *Cethosia Lamarckii*,

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and *C. Leschenaultii*, are instances of butterflies which are common in East but not found in West Java. *Tenaris* is a typical Austro-Malay genus found in Java, but not I think in Sumatra or Borneo. In the island of Nias we find a purely Indo-Malayan fauna, to which perhaps the most notable exception is *Miletus cælisparsus*, Butt., a Lycænid of Papuan type.

In the Philippine group, of whose butterflies we have now an excellent account by Semper,* I find only a very few genera which are not characteristic of the whole Indo-Malay sub-region; *Acropthalmia*, *Ptychandra*, and *Hypothecla* being exceptions. *Thysonotis* and *Phrissura* are perhaps the only forms showing Australian affinities.

In Sumba and Sambawa, Doherty's explorations have shown an overwhelming proportion of Indian as compared to Australian types, as I hope to show more clearly when I have time to work out his collections.

It is only when we come to Celebes and the Moluccas that any marked change becomes evident, and even here the difference is nothing like so great as among birds and mammals.

Wallace, in his classical paper on "The Papilionidæ of the Malayan Region,"† states that Celebes is the most peculiar of all the islands in the Archipelago, for though it has a smaller number than either Borneo or Java, no less than eighteen of its Papilionidæ are peculiar, whilst Java, Sumatra, Borneo, and Malacca, with forty-five species, have only twenty-one, or less than half peculiar.

Wallace shows that of the nineteen groups into which he divides the Malayan Papilionidæ, only three, viz., the *Priamus*, *Ulysses*, and *Erecthus* groups, are peculiar to the Austro-Malayan sub-region, and when we come to inquire what are the elements in this sub-region which connect it with the Australian continent we hardly find any. Though far too little is yet known of the insects or even of the butterflies of Papua and its surrounding islands, to

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* Semper, Die Schmetterlinge der Philippinischen Inseln. 1892.

† Trans. Linn. Soc., vol. xxv (1865).

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enable us to analyze their constituent elements, yet I am strongly of opinion that from my present point of view the Austro-Malayan sub-region must be attached to India and not to Australia, and in this case I am in accordance with the views of botanists. My knowledge of this sub-region is, however, too slight, and my collection entirely inadequate to illustrate it this evening, and I therefore propose to leave the question in abeyance for the present.

We now arrive at a very critical point in the investigation, which is to see what is the relative value of the Australian fauna, as compared with those of other regions, and what is its position as a primary division. I must confess that I am unable, from personal knowledge, to answer this question, as, after taking a general survey of the Australian Lepidoptera, I was inclined to say that, on their evidence alone, the Australian region could hardly be said to exist. But on applying to Mr. E. Meyrick, whose personal knowledge of the region is extensive, and whose critical accuracy in describing and classifying the Lepidoptera of Australia makes his opinion most valuable, I received the following remarks, which I quote in extenso. He writes as follows:—

"Confining myself to the Lepidoptera, New Zealand "and Australia cannot possibly be classed together. They "have hardly any species in common; the few they "have are undoubtedly either (1) recent immigrants from "one to the other, or (2) insects of world-wide range, as "*Heliothis armigera*, or (3) artificially introduced. Their "genera are equally distinct; no genus is prominent in both, "except such as are also prominent throughout all regions. "In fact, on a consideration of general affinity, New Zealand "is really much more related to England that to Australia.

"(2) Australia is quite as distinct from the other continents "in Lepidoptera as it is in mammals and plants. The follow- "ing are some instances. A peculiar family of *Pyralidina* "(the *Tineolidæ*), consisting at present of four monotypic "genera, is confined to Australia (it is more ancient than any "English family, being the ancestor of the *Pterophoridæ*); "this may be compared with the *Monotremata*, which consist "of three monotypic genera.

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"The *Œcophoridæ* are enormously developed in Australia "(I have nearly nine hundred species), whilst those known "from the rest of the world do not probably reach a hundred "and fifty. This is a parallel case to the excessive develop- "ment of the *Myraceæ*, and of such genera as *Acacia*. The "*Geometrid* family *Monoctenidæ* are known to have about one "hundred species in Australia, and about thirty in the rest of "the world. The *Xyloryctidæ*, a group of *Tineina*, are perhaps "not entitled to rank as a family, but only as a group of the "*Gelechiadæ*. However, in any case they form a natural and "distinct group, including already over one hundred species "in Australia, whilst only one or two others have been found "elsewhere. I could give many other cases of large "genera, or groups of genera, mainly or entirely confined "to Australia.

"A more peculiar case (not, I think, paralleled in other "forms of life) is that of *Crambus*, which is largely developed "throughout the whole world except Australia and the adja- "cent islands, though Australia is eminently suited for it. "There are two species in Australia, one an insect which "occurs throughout most of Europe, Asia, and Africa, the "other a Malayan and South Pacific species, so that both "must be supposed to have immigrated; in New Zealand "there are about thirty endemic species.

"(3) New Zealand is remarkable for its poverty; only "about six hundred species are known, and there cannot be a "great many more, but probably some have already become "extinct. Most of the groups usually classed as *Bombycina* "and *Sphingina* are altogether absent. The larger genera "are all such as are common to all regions. Where, how- "ever, there is a marked affinity in respect of any more "peculiar genera, the affinity is undoubtedly with South "America. There is also a strong archaic element; various "small genera of one or two species, belonging to ancient "types, probably once generally prevalent, but now every- "where nearly extinct. Noticeable genera are—

"*Diptychophora*, fourteen species (several others in South "America, one in Australia); *Scoparia*, sixty species, more "than are known from the rest of the world, though the

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" genus is cosmopolitan; *Heliostibes*, three species, only " known otherwise from South America. The *Micropterygidæ*, " eight species, are only known otherwise from Europe, North " and South America. Many large families, such as the " *Phycitidæ*, are wholly, or almost wholly, absent.

"(4) The distinctness of the Australian fauna is to some " extent masked by the great influx of Malayan species " into the northern portions, a comparatively recent phe- " nomenon.

"(5) So far as I am acquainted with the fauna of the " South Pacific islands, it seems very fragmentary and miscel- " laneous, more Malayan than anything else, but it is very " inadequately known as yet."

This evidence is very striking, and if confirmed by other groups of insects would justify the retention of Australia as one of the primary regions; but it must not be forgotten that our knowledge of these obscure groups in most parts of the world, and especially in the tropics, is, one may say, infinitesimal, and though I am quite as ready to attach weight to evidence drawn from obscure and little-known insects, as from the more striking and better-known groups, yet the classification on which the whole theory rests must be sound and well determined, and I fail to see how any system of classification can be more than provisional which is not based on a much greater amount of material than I think Mr. Meyrick at present possesses.

Lord Walsingham, however, whose special knowledge of the *Tineina* of the world gives his opinion great weight, and to whom I submitted Mr. Meyrick's remarks, agrees with him. Provisionally accepting, therefore, Australia as one of the primary divisions, can it be subdivided?

New Zealand must, according to Meyrick, stand apart, though if it is not a province of the Australian region it can hardly be included in any other.

Its very few species of butterflies comprise one or two wide-ranging forms which are probably immigrants. The principal others are

Two endemic species of *Vanessa*.

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Four species of a genus resembling and nearly allied to *Chrysophanus*, all of which are endemic.

Two species of a genus allied to *Erebia*, peculiar to the mountain ranges of the South Island.

And one very striking butterfly, *Argyrophenga antipodum*, whose nearest allies are found in the mountains of Chili.

Papua and its islands, with the extreme northern promontory of Australia, ought, on the evidence of its butterflies, to form with the Moluccas and Celebes a province of the Indo-Malay region; and the Pacific Islands do not, as far as we know, possess anything like the number of peculiar or characteristic forms of insects to justify their separation, the majority of the Lepidoptera known from them belonging to very wide-ranging and Malayan genera. Thus we find, that even if the Australian region is to rank with the other great divisions of the earth, it must do so for the present rather on negative than on positive evidence.

I must now conclude what I fear to some of my hearers has been a somewhat tedious address, but which I hope may give rise to an interesting discussion at our next meeting. The specimens illustrating it will be, by the kind permission of Sir W. Flower, deposited in the British Museum for a time, in order that they may be more closely examined by anyone who wishes to do so. If I shall have succeeded in leading some of our Fellows to pay more attention to a most interesting branch of our subject, I shall feel, however, that your time has not been wasted. The subject of distribution is one which requires sound systematic work as a basis, but cannot be profitably studied by systematists alone without some knowledge of the geographical, meteorological, and geological features of the earth. All of these are essential aids to the proper consideration and appreciation of the numerous difficulties we meet with in trying to explain the facts which are presented to us, and a knowledge of all of them will add immensely to the interest and pleasure of travel, which I look on as an essential part of the education of a modern naturalist.

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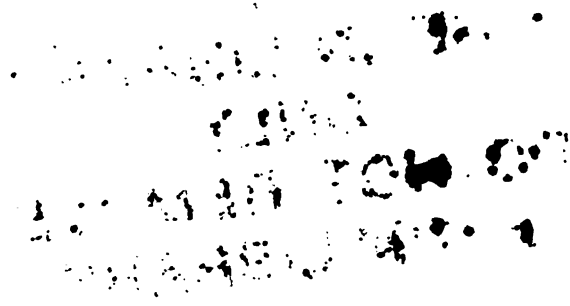

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